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CA 2199084 C 2005/05/31

(11)(21) 2 199 084

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1997/03/04

(41) Mise à la disp. pub./Open to Public Insp.: 1997/10/19

(45) Date de délivrance/Issue Date: 2005/05/31

(30) Priorité/Priority: 1996/04/19 (AN96A000007) IT

(51) Cl.Int. 6/Int.Cl. 6 B29D 31/505, B29C 44/04

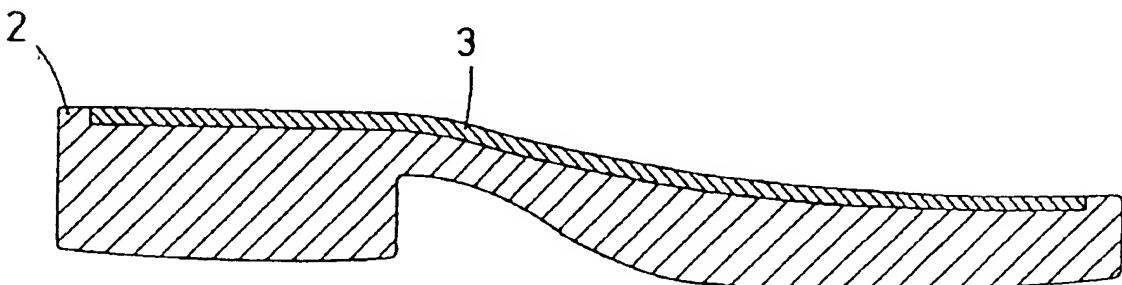
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(54) Titre : PROCEDE DE MOULAGE PAR INJECTION POUR SEMELLES EN COMPOSES RETICULES EXPANSIBLES
A BASE D' EVA

(54) Title: INJECTION MOULDING PROCESS FOR SOLES IN EXPANSIBLE AND CROSS-LINKING "EVA" BASED
COMPOUNDS



(57) Abrégé/Abstract:

This invention concerns an injection moulding process for soles in expandable and cross-linking "EVA" based compounds characterised in that during the cooling stage of the moulded sole the spontaneous shrinkage of the same is arrested by means of a template consisting of a rigid shaped plate placed on the sole so that its edge connects with a perimeter edge realised specifically on the upper surface of the sole, whose dimensions reduce no further either during the remaining cooling phase or after cooling.

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Injection Moulding Process for Soles in Expansible and Cross-linking "EVA" Based Compounds

This patent application concerns an injection moulding process for soles in expansible and cross-linking "EVA" based compounds.

The patent protection is also extended to the sole obtained with 5 the process according to the invention.

The abbreviation "EVA" refers to "vinyl-acetate ethylene copolymer" which, according to the type of additive used, may be thermoplastic or expansible and cross-linking.

10 In the case of the latter type, an expanding powder additive is used which decomposes at a specific temperature to produce gases which give rise to a typical phenomenon which occurs in injection moulding using this type of "EVA", consisting of the instantaneous expansion of the part as soon as the mould is opened.

15 In particular the dimensions of the part increase rapidly while the proportions and shape remain unaltered thus maintaining a ratio of perfect similarity with the impression of the matrix.

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According to this innovative idea, based on the expansion ratio of the material and that of its shrinkage during cooling, the impression of the mould is designed so that the moulded sole is slightly undersized after cooling and shrinkage with respect to

5 the nominal dimensions of the size in question, which are however strictly respected by arresting the spontaneous shrinkage of the sole during cooling.

For this purpose, the process according to the invention involves the use of a template consisting of a thin and flexible plate of 10 rigid material placed during cooling so as to adhere on the moulded sole which in turn has a raised perimeter edge along its upper surface, that surrounds and holds the edge of the template before cooling is completed, thereby preventing additional shrinkage of the sole whose dimensions reduce no further either 15 during or after cooling.

For major clarity the description of the process according to the invention continues with reference to the enclosed drawings which are intended for purposes of illustration and not in a limiting sense and which schematically show the moulded sole 20 before and after shrinkage following cooling, whereby:

- fig. 1 is a cross-section along a longitudinal plane of the sole injected with expansible and cross-linking "EVA" compounds immediately off the mould in maximum expansion dimensions;
- fig. 2 is a top view of the sole in fig. 1 on which the template 25 designed to arrest the spontaneous shrinkage of the sole during the post-moulding cooling stage, is placed;
- fig. 3 is a cross-section of the sole in fig. 2 along a longitudinal plane III-III;

According to the process in question, a template (3) is placed on the sole (1) immediately off the mould, said template consisting of a thin flexible plate made of rigid material such as rigid PVC, having a profile similar to that of the sole (1) but sized to fit into

5 the perimeter edge (2), which, before completion of the cooling process, encircles and holds the edge (3a) of said template (3), so as to prevent additional shrinkage of the sole whose dimensions reduce no further either during or after cooling.

10 After cooling, template (3) is prised off the edge (2) by which it is encircled.

The sole (4) thus obtained, is shown in fig. 5, with the same shape but reduced dimensions with respect to the sole (1) shown in figure 1.

15 The dimensions of the template (3) must therefore be sized to ensure that the shrinkage of the sole (1), during cooling, is stopped when the dimensions of the sole correspond exactly to the nominal dimensions of the sole size in question.

Finally, in order to ensure perfect adhesion of the template (3) on the sole (1), the process according to the invention provides that 20 a slight pressure be created on the template, during cooling, by suitable means, the most convenient and simplest of which may consist of small weights placed on the template (3).

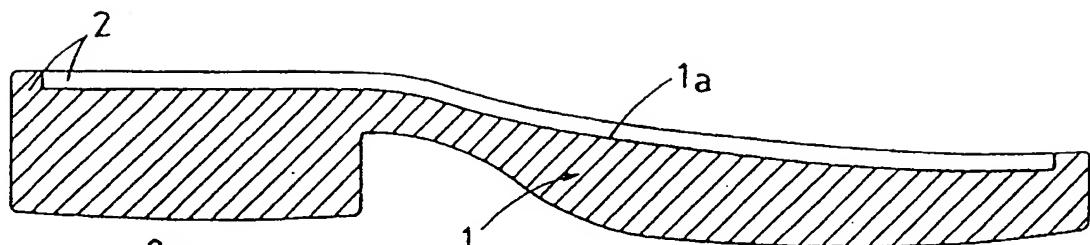


FIG. 1

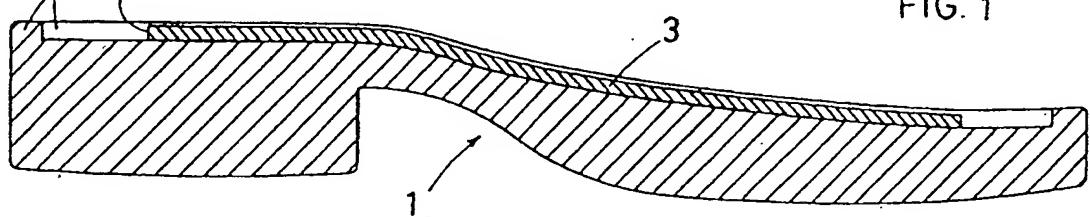


FIG. 3

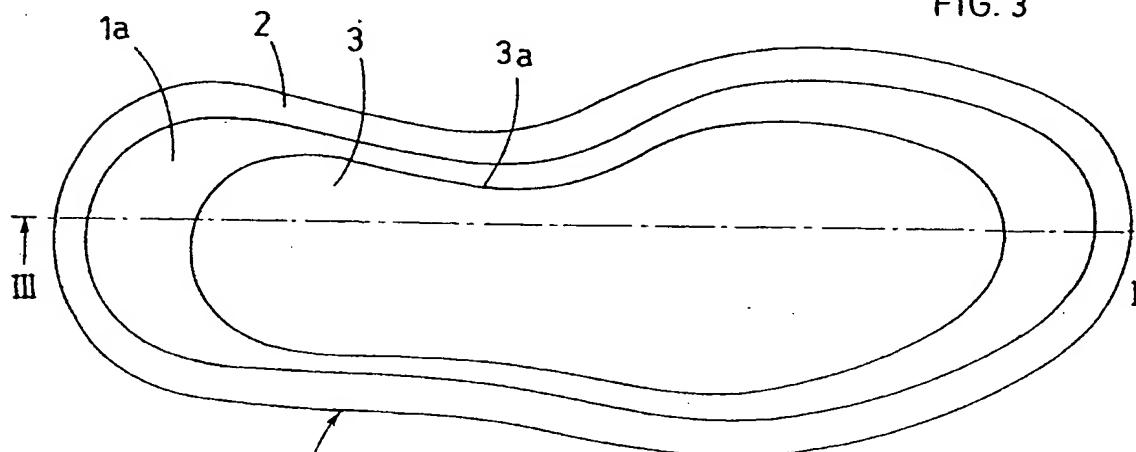


FIG. 2

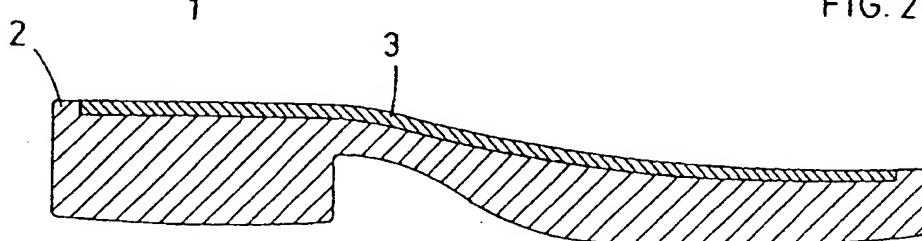


FIG. 4

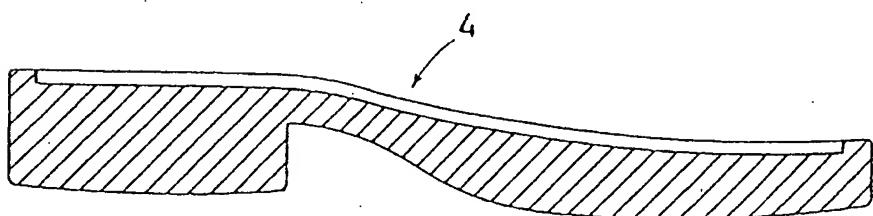


FIG. 5

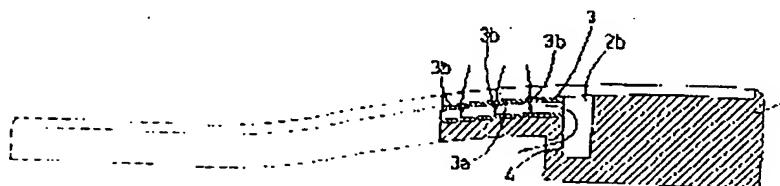
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02238842 Demande-Application

(21) (A) 2,238,842
(22) 1998/05/27
(23) 1998/12/13

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(51) Int. Cl. 6 A43B 2/08
(60) 1997/06/13 (M197A000056) IT

(54) SEMELLE DE CHAUSSURE AVEC ELEMENT AMORTISSEUR
CAPABLE D'ASSURER UNE CIRCULATION D'AIR FORCE
DANS LA PARTIE INTERNE DE LA CHAUSSURE
(54) SHOE SOLE WITH CUSHIONING ELEMENT CAPABLE OF
ENSURING FORCED AIR CIRCULATION IN THE INNER
SECTION OF THE SHOE



(57) La demande de brevet porte sur une semelle de plastique moulé comprenant un conseil de pompage souple qui fournit air dans la chaussure lorsque la personne qui la porte marche. L'air passe ensuite dans une chambre d'évacuation prévue dans la semelle et communiquant avec l'extérieur grâce à un trou d'évent.

(57) This patent application concerns a moulded plastic sole with pliable pumping cushion which, as the person wearing the same walks, forces air into the sole and through an evacuation chamber with which the sole is fitted and which is connected to the exterior by means of one or more breather holes.



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Claims

- 1) A shoe sole moulded in plastic characterised by a cavity occupying most of the length of the upper surface and consisting of two consecutive sections, the first front section (2a) of which is designed to house a pumping cushion (3) and the second back section (2b) being designed to communicate with the exterior thanks to one or more breather holes (4) opening on the external walls of the sole; it being provided that the pumping insert (3) realised in elastic pliable material features an internal series of rectilinear ducts (3a) parallel to the longitudinal axis of the sole (1) communicating with the exterior thanks to a series of holes (3b) on the upper surface of the pumping insert (3).
- 2) A shoe sole moulded in plastic according to claim 1 characterised in that the above breather holes (4) are fitted with respective unidirectional valves.

means of a series of longitudinal air passages in the sole at approximately the level of the shank.

The air drawn into the shoe by the opposing pumping insert is then conveyed into the longitudinal air ducts and from these 5 flows into the chamber positioned on the heel from which it is evacuated to the exterior of the shoe through one or more breather holes opening on the sides of the heel.

As far as the pumping element is concerned, it should be noted that to date on the most commonly used models the 10 same is realised in rather soft materials and is fitted with a closely fitted series of pliable hollow fingers each of which is provided with a respective hole through which air is drawn into the inner section of the shoe.

The energetic pressure placed on these fingers by the sole of 15 the foot due to the impact of the shoe on the treading surface compresses the same thereby forcing the air out into the longitudinal air passages which in turn convey the air to the evacuation chamber.

It is evident that each finger of the above pumping insert 20 elastically resumes its shape as soon as the foot lifts from the ground; obviously this expansion again forces air into each hollow finger which is again forced out as described above when the shoe is again pressed against the treading surface.

The sole according to the invention is a valid alternative to this 25 tried and tested technique in that it provides the same practical result with a less sophisticated and consequently less costly structure which is easier to produce.

In particular the item according to the invention supercedes the prior manufacturing principle requiring two separate

cushion in the respective housing and consequently ensures absolute stability in the sole according to the invention.

The ducts provided in the cushion in question produce a pumping action which in the conventional models was 5 produced by the yielding fingers.

When the cushion housed in the sole according to the invention is pressed by the weight of the foot, the air in the inner ducts is forced out and when the sole is lifted from the treading surface the inner ducts spontaneously resume their 10 original shape and are again filled with air through the series of holes provided therefor.

In this regard it should be noted that the air in the inner ducts of the pumping insert in question can escape only through the rear section of the cavity, which is the only cavity not occupied 15 by the cushion.

For the remaining perimeter in fact of the pumping insert the ends of the ducts are "sealed" by the vertical walls of the housing which prevents air from escaping and consequent loss of pressure.

20 This means that the air expelled from the cushion, thanks also to the longitudinal positioning of its inner ducts, can only be forced into the evacuation chamber provided on the heel of the sole according to the invention.

In this sense it is obvious that the longitudinal ducts of the 25 pumping cushion fitted on the sole according to the invention replace, in terms of positioning and function, the rectilinear ducts which in conventional soles link the front housing section and the rear air evacuation chamber.

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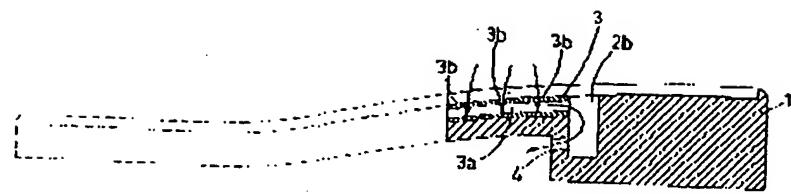
It should be noted that a unidirectional valve to prevent air, dust or water from the exterior from entering in the evacuation chamber (2b) could be fitted on said breather hole (4).

Regarding the pumping insert (3), the same consists of a pliable elastic plastic cushion provided internally with a series of rectilinear ducts (3a) positioned parallel to the longitudinal axis of the sole (1); the upper surface of the cushion (3) being provided with a series of holes (3b) designed to link the above inner ducts (3a) to the exterior.

As mentioned above, the particular positioning of the ducts (3a) of the pumping insert (3), parallel to the longitudinal axis of the sole (1) ensures that every time the pumping insert (3) is pressed - the air in the same flows directly into the empty rear section (2b) of the above cavity, namely the section which acts as the evacuation chamber.

It should be mentioned that shoes fitted with the sole according to the invention must be provided internally with a hygienic inner sole having numerous through holes preferably coinciding with the position of the holes (3b) which allow air to enter the pumping insert (3).

This feature is designed to prevent the inner sole from sealing the upper surface of the underlying pumping insert (3) thereby preventing the air in the shoe section from being drawn into the same.



SANDAL WITH INTERCHANGEABLE UPPER AND SOLE

ABSTRACT OF THE DISCLOSURE

A sandal comprises a sole and an upper. The sole is provided in a side with a connection piece. A stop member is fastened with the connection piece. The upper is provided at an end with a connection hole for connecting the stop member. The connection piece of the sole may be provided with a hooked member which is fastened therewith fixedly or detachably. The hooked member has a neck. The upper is provided with a connection hole and a fitting hole in communication with the connection hole. The neck of the hooked member is retained in the connection hole of the upper. The upper or heel strap is detachably fastened with the sole.

not cost-effective.

SUMMARY OF THE INVENTION

It is the primary objective of the present invention to provide a sandal which is versatile in design and having interchangeable sole and upper.

It is another objective of the present invention to provide a sandal with sole and upper which can be easily assembled or replaced.

It is still another objective of the present invention to provide a sandal with interchangeable and recyclable sole and upper easily.

In keeping with the principle of the present invention, the foregoing objectives of the present invention are attained by a sandal comprising a sole and an upper. The sole is provided in left and right sides with a connection piece and a stop member connected with the connection piece. The upper is provided at two ends with a connection hole for connecting the stop member. A hooked member is detachably fastened with the connection piece. Another upper is provided with a connection hole and a fitting hole for fitting the hooked member such that a neck of the hooked member is retained in the connection hole of the upper.

FIG. 10 shows an exploded view of another preferred embodiment of the present invention.

FIG. 11 is a front view of the preferred embodiment of the present invention to show its pre-engagement state.

FIG. 12 is the same as the engagement state of FIG. 11.

FIG. 13 is the same as the post-engagement state of FIG. 11.

FIG. 14 is a schematic view of another fastening member of another preferred embodiment of the present invention to show the square state of its fastening portion.

FIG. 15 is an exploded view of still another preferred embodiment of the present invention to show that its hooked member is integrally made.

FIG. 16 shows a sectional view of still another preferred embodiment of the present invention in combination.

FIG. 17 is a schematic view of still another preferred embodiment of the present invention to show that the hooked member is enclosed by the sole.

FIG. 18 is a sectional view of another preferred embodiment of the present invention to show that each connection piece of the sole has an arcuate shape.

20 such that the upper is confined by the shoulder 35 of the stop member 30. The upper 40 is provided with a heel strap 80.

As shown in FIGS. 2 and 3, the upper 40 is detachably fastened with the sole such that the fastening portion 23 of one of the fastening members 20 is put through the disposition hole 15 of each connection piece 13 of the sole 10. The fastening portion 23 of the fastening member 20 is jutted out by a predetermined length. The portion that is jutted out is fitted with the connection hole 45 of the connection portion 43 of the upper 40. In the meantime, the threaded rod 33 of the stop member 30 is engaged with the threaded hole 25 of the fastening member 20. The shoulder 35 prevents the upper 40 from falling out.

The upper can be detached by following the above-mentioned steps in reverse.

As shown in FIG. 5, the fastening portion of the fastening member of the preferred embodiment of the present invention is a two-stepped cylindrical pillar different in diameter to cooperate with the connection holes of the upper. As shown in FIG. 6, the fastening portion of the fastening member has a square shape, which is corresponding to the shape of the disposition hole of the sole.

As shown in FIGS. 7-10, a sandal of another preferred embodiment of the present invention comprises the following component parts.

A sole 10 is similar to that of the preceding embodiment.

A plurality of fastening members 20A are similar to those of the

shown in FIG. 13.

As shown in FIG. 14, the fastening portion of the fastening member 20A has a square shape. The disposition hole of the sole also has a square shape.

The fastening members 20, 20A of the two preceding embodiments are not confined to the interchangeable combination and may be enclosed at the time when each connection piece of the upper is formed.

As shown in FIGS. 15 and 16, is a sandal of still another preferred embodiment of the present invention. The fastening member 20 and the hooked member 30 of the second preferred embodiment are made integrally to form a hooked member 70 which is formed of a head 71, a neck 73, a shoulder 75, a shank 77, and a stop tray 79. The shank 77 is fixed in the disposition hole of each connection piece of the sole. The neck 73 is caught in the connection hole of the upper.

As shown in FIG. 17, the hooked member 70A is formed together with the connection piece such that the hooked member 70A is enclosed by the connection piece.

The shapes of the preceding embodiments are expressed by straight lines. However, the shapes are various, depending on their locations, as shown in FIG. 18 in which the connection piece 13A of the sole and the connection piece 63B of the upper are arcuate to cooperate with the foot. The fastening member 20B may be also arcuate so as to be harmonious with the mechanics of human body.

WHAT IS CLAIMED IS:

1. A sandal comprising:

a sole provided in a side with a connection piece;

a fastening member fastened fixedly or movably with said connection piece of said sole and provided with a fastening portion, said fastening portion further provided with a threaded hole extending from an outer end thereof;

a stop member having a threaded rod which is engaged with said threaded hole of said fastening member, a shoulder fastened at an end of said threaded rod such that said shoulder is separated from said connection piece of said sole by a predetermined distance; and

an upper provided at an end with a connection hole for fixing said fastening portion of said fastening member, said upper having an outer side which is stopped by said shoulder of said stop member, and said upper being connected at another end thereof with said sole.

2. The sandal as defined in claim 1, wherein said upper is provided at an end with a connection piece; wherein said connection hole of said upper is located in said connection piece of said upper.

3. The sandal as defined in claim 1, wherein said connection piece of said sole is provided with a disposition hole; wherein said fastening portion of said fastening member is put through said disposition hole of said connection piece of said sole.

7. The sandal as defined in claim 4, wherein said neck of said hooked member is provided in a side with a shoulder for separating said connection piece of said sole from said upper.

8. A sandal comprising:

a sole provided in a side with a connection piece;

a hooked member fastened fixedly or movably with said connection piece of said sole and provided with a neck;

an upper provided in a side with a connection piece having a connection hole for fixing said neck of said hooked member, said connection piece of said upper being further provided with a fitting hole in communication with said connection hole, said fitting hole and a juncture of two sides of said connection hole being provided with a stop edge for stopping said neck of said hooked member, and said upper being connected at another end thereof with said sole.

9. The sandal as defined in claim 8, wherein said connection piece of said sole is provided with a disposition hole; wherein said hooked member have a fastening portion which is fixed in said disposition hole of said sole.

10. The sandal as defined in claim 8, wherein said neck of said hooked member is provided in a side with a shoulder for separating said connection piece of said sole from said upper.

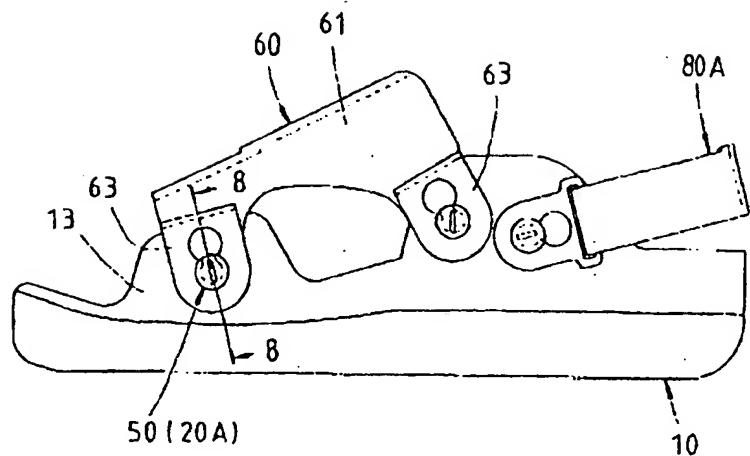


FIG. 7

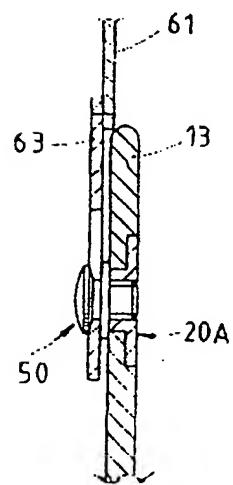


FIG. 8

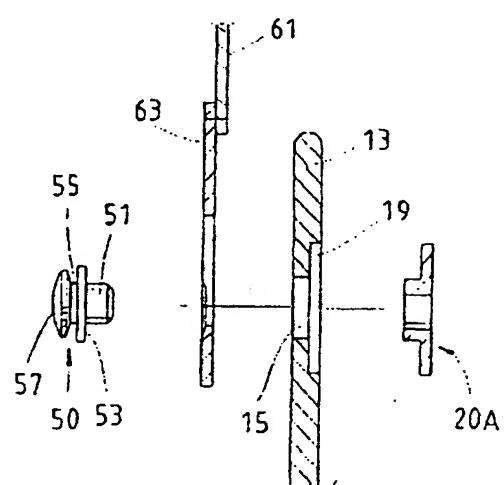


FIG. 9

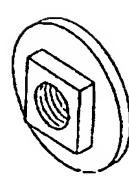


FIG. 14

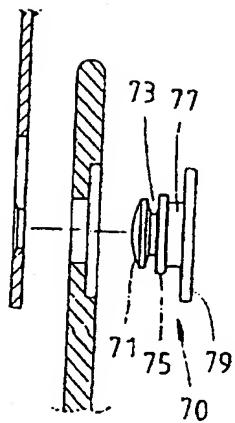


FIG. 15

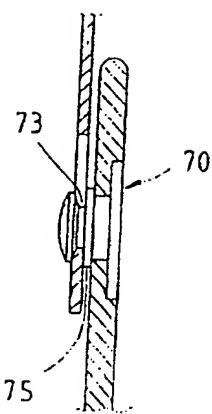
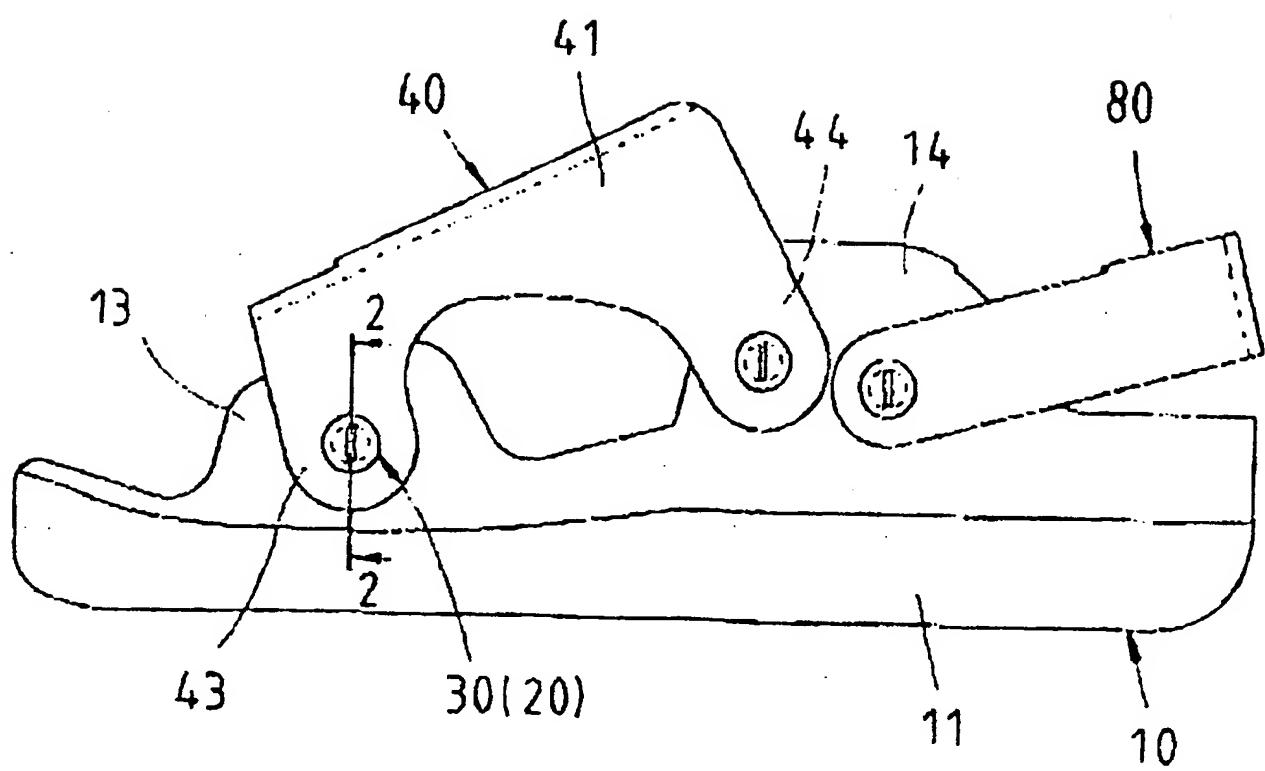


FIG. 16

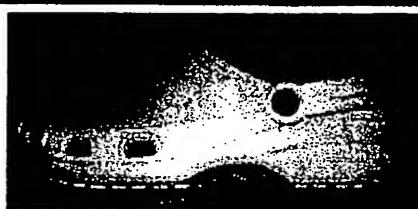


FIG. 17

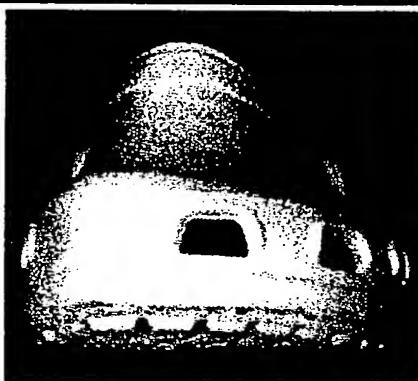




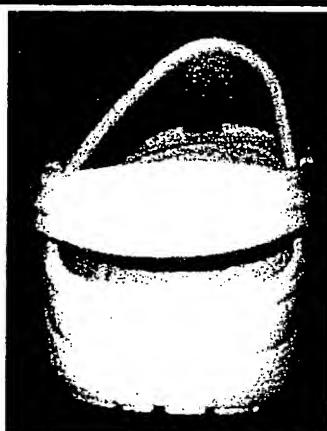
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54 ES - Calzados

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LT - Avalynė

HU - Lábbelik

MT - Xedd tas-saqajn

NL - Schoeisel

PL - Obuwie

PT - Calçado

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SL - Obutev

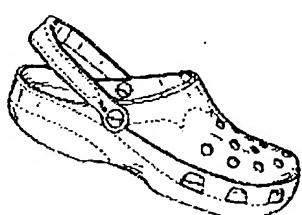
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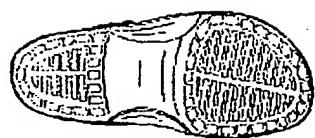
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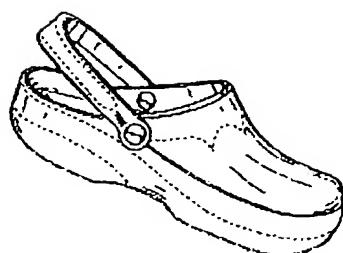
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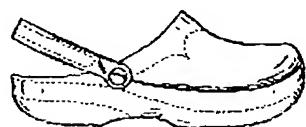


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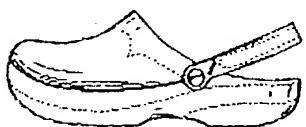




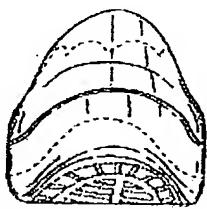
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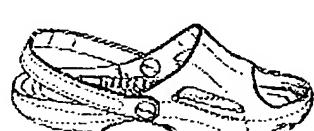
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EL - Παπούτσια

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MT - Īraben

NL - Schoenen

PL - Buty

PT - Sapatos

SK - Topánky

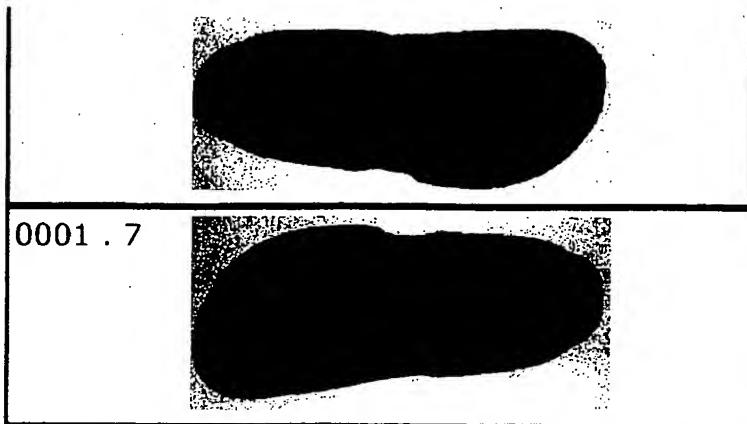
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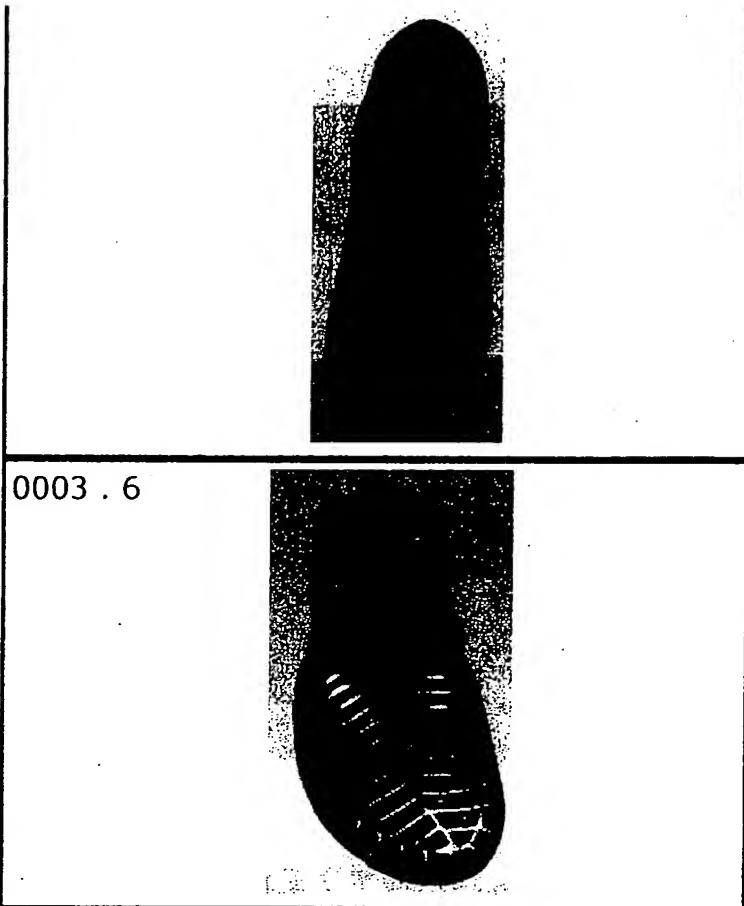
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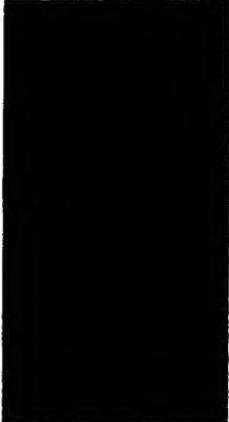
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(11)

EP 0 802 039 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.10.1997 Bulletin 1997/43

(51) Int Cl. B29D 31/515

(21) Application number: 97830141.4

(22) Date of filing: 25.03.1997

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI NL PT
SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: 19.04.1996 IT AN960009

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(54) Injection moulding method for EVA-soles, having a treading surface with coloured sections

(57) This invention concerns an injection moulding process for soles having a coloured treading surface produced with expandable and cross-linking "EVA" compounds involving the use of coloured inserts (5) mould-

ed with the same moulding material used for sole, but of a different colour, fed into cups (4) on the bottom of the mould impression and shut by caps (8) also moulded in the same material used to mould the soles.

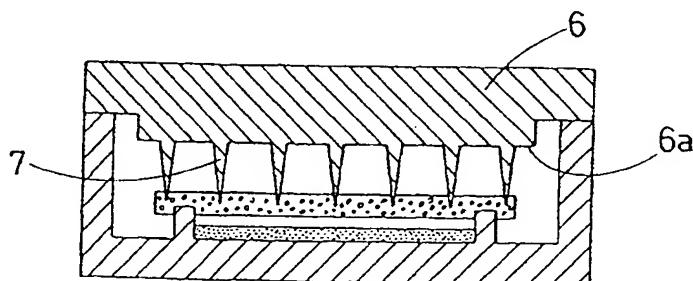


FIG. 4

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The method according to the invention also involves the use of inserts (5) consisting of plates moulded in the same materials used to mould the sole, but of a different colour; said inserts (5) being moulded by heating the granules of expanding and cross-linking "EVA" based compound to melting point, without however reaching the higher temperature which triggers the cross-linking and decomposition of the expanding fillers.

The method according to the invention also entails the use of caps (8) which shut said cups (4), consisting of pads moulded in the same material used to mould the sole; the caps (8) being moulded by heating the granules of expanding and cross-linking "EVA" based compound to melting point, without however reaching the higher temperature which triggers the cross-linking and decomposition of the expanding fillers.

In particular, said caps (8) are provided on their bottom surface with a perimeter groove (8a) designed to couple precisely with the annular rib (3) delimiting each cup (4) housing the inserts (5).

In order to ensure said coupling, the thickness of the coloured inserts (5) is inferior to the height of the annular ribs (3).

In consideration of the foregoing, the method according to the invention provides that the moulding phase of the sole occurs as follows:

- a) - fitting onto the mould (1) of the inserts (5), each of which is housed into a corresponding cup (4);
- b) - fitting onto the mould (1) of the caps (8), each of which is housed above a corresponding cup (4) so as to ensure coupling between the perimeter groove (8a) of the cap (8) and the rib (3) delimiting the cup (4);
- c) - closing of the mould;
- d) - injection of the moulding material;
- e) - opening of the mould after a time that ensures cross-linking and decomposition of the expanding fillers simultaneously in the injected mass, in the molten mass of the inserts (5) and in the molten mass of the caps (8).

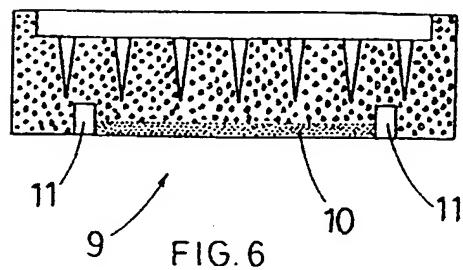
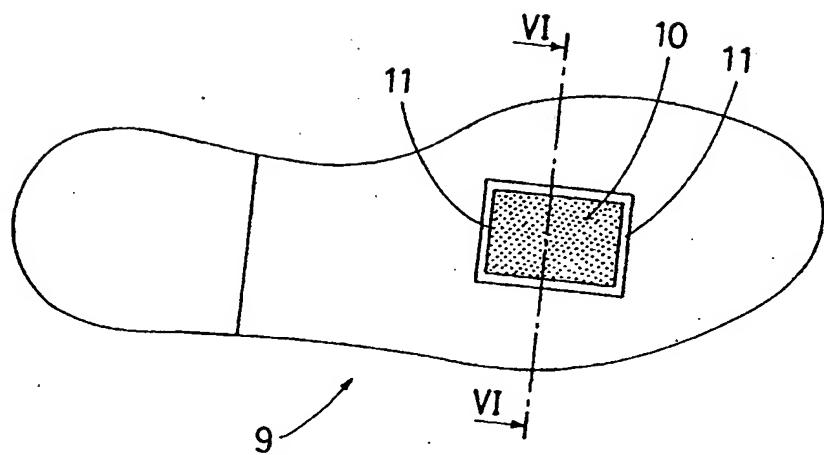
As shown in figures 5 and 6, the sole (9) obtained with the method according to the invention is provided on its treading surface with one or more sections (10) of different colours with respect to that of the sole (9) delimited by a run (11) that corresponds to the impression produced by the annular rib (3) delimiting the cup (4) in which the insert (5) is fitted and from which each coloured section (10) is produced.

Claims

1. A method for injection moulding soles realised with expanding and cross-linking "EVA" based compounds having coloured sections on its treading surface, characterised by:

- the provision of shaped inserts (5) consisting of plates moulded with the same type of expanding and cross-linking "EVA" based compound used to mould the sole, but of a different colour, whose granules are heated to melting point without however reaching the higher temperature which triggers cross-linking and decomposition of the expanding fillers;
- provision and use of a special mould (1) whose impression (2) is provided on its bottom wall (2a) with the same number of annular ribs (3) delimiting the same number of cups (4) exactly conforming to the above coloured inserts (5), while the cover (6) of the mould (1) is provided on each of the cups (4) with a series of closely packed rods (7) projecting from its internal surface (6a);
- the provision of caps (8) which seal said cups (4), consisting of shaped pads moulded with the same expanding and cross-linking "EVA" based compound used to mould the sole, whose granules are heated to melting point without however attaining the higher temperature which triggers cross-linking and decomposition of the expanding fillers;
- fitting onto the mould (1) of the inserts (5), each of which is housed into its respective cup (4);
- fitting onto the mould (1) of the caps (8), each of which is housed above its corresponding cup (4);
- closing of the mould (1);
- injection of the moulding material into the mould (1);
- opening of the mould (1) after a time that ensures cross-linking and decomposition of the expanding fillers simultaneously in the injected mass, in the molten mass of the inserts (5) and in the molten mass of the caps (8).

2. A method according to the previous claim characterised by the provision of caps (8) to shut said cups (4) having a perimeter groove (8a) at the bottom which couples with the annular rib (3) of the cup (4) shut by the cap (8).
3. An injection moulded sole realised in expanding and cross-linking "EVA" based compound having coloured sections on its treading surface, and produced with the method described in the previous claims.



Description

This patent application concerns an injection moulding process for soles in expandable and cross-linking "EVA" based compounds.

The patent protection is also extended to the sole obtained with the process according to the invention.

The abbreviation "EVA" refers to "vinyl-acetate ethylene copolymer" which, according to the type of additive used, may be thermoplastic or expandable and cross-linking.

In the case of the latter type, an expanding powder additive is used which decomposes at a specific temperature to produce gases which give rise to a typical phenomenon which occurs in injection moulding using this type of "EVA", consisting of the instantaneous expansion of the part as soon as the mould is opened.

In particular the dimensions of the part increase rapidly while the proportions and shape remain unaltered thus maintaining a ratio of perfect similarity with the impression of the matrix.

Expandable and cross-linking "EVA", thanks above all to its low cost, is widely used in the footwear sector for the production of inexpensive injection moulded soles.

It is not however currently possible with this material to mould soles with a raised trim along the sides since the expansion of the part when the mould is opened requires the perimeter of the sole to be milled in order to reduce the sole to the necessary dimensions.

In other words, since it is not possible to control this expansion precisely, it is currently necessary to dimension - according to the expansion ratio of the material and that of its shrinkage during cooling - the impression of the mould so that the cooled moulded sole is slightly oversized with respect to the nominal dimensions of the sole sizes in question, which are obtained by milling away a surface layer of material along the entire perimeter of the sole.

It is thus obvious why this material and moulding system can not be used for soles which have a raised trim, such as a welt, a part or all of which would be removed when the sides of the sole are milled.

The purpose of this invention is to design an injection moulding process for soles made of expandable and cross-linking "EVA" that makes it possible to produce a perfectly sized sole and to eliminate the costs and limitations of the milling which is currently necessary to size soles made of expandable and cross-linking "EVA" compounds.

The process according to the invention derives from an idea for a solution which is, in general terms, exactly opposite to that on which current production techniques are based.

According to this innovative idea, based on the expansion ratio of the material and that of its shrinkage during cooling, the impression of the mould is designed so that the moulded sole is slightly undersized after cool-

ing and shrinkage with respect to the nominal dimensions of the size in question, which are however strictly respected by arresting the spontaneous shrinkage of the sole during cooling.

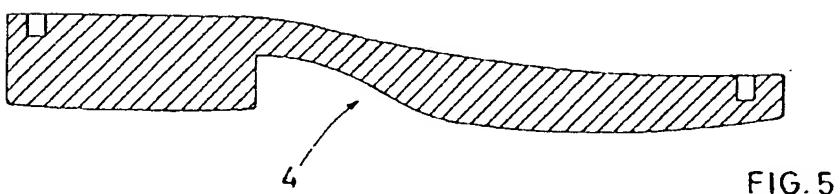
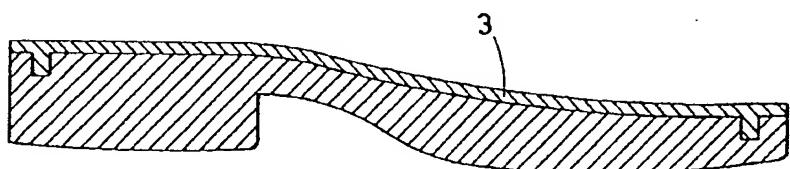
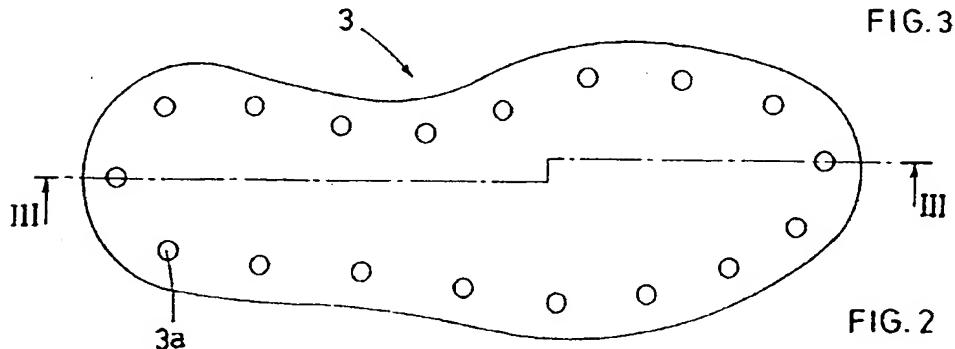
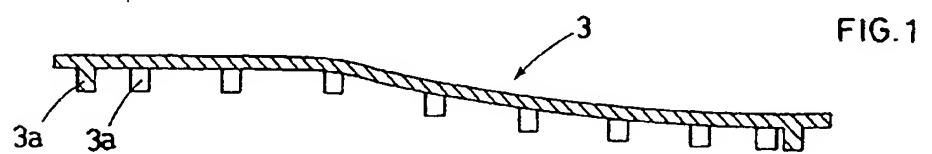
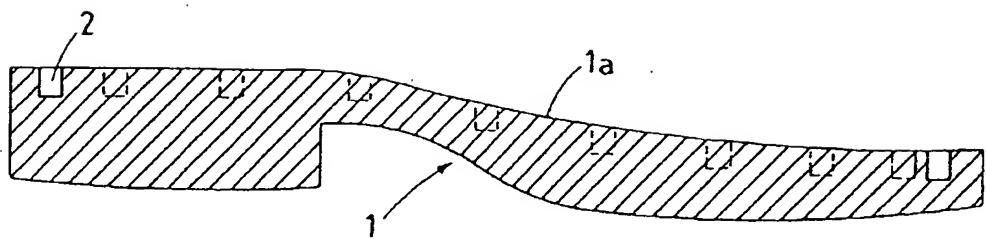
For this purpose, the process according to the invention involves the use of a template consisting of a thin and flexible plate from whose bottom edge project a series of perimeter pin elements to which said template may be joined integrally or coupled with the sole, which is in turn provided on its upper surface with a series of perimeter holes corresponding to the above pin elements. It follows that the coupling of the sole and template must occur before the cooling process of the sole is completed and when said series of holes, drawn together by the gradual shrinkage of the sole during cooling, are positioned exactly over the template pin elements, which after housing into the respective holes, prevent any further shrinkage of the sole, whose dimensions reduce no further either during or after cooling.

For major clarity the description of the process according to the invention continues with reference to the enclosed drawings which are intended for purposes of illustration and not in a limiting sense and which schematically show the moulded sole before and after shrinkage following cooling, whereby:

- fig. 1 is a cross-section along a longitudinal plane of the sole injected with expandable and cross-linking "EVA" compounds immediately off the mould in maximum expansion dimensions;
- fig. 2 is a view from the bottom of the above template designed to arrest the shrinkage of the sole during the post-moulding stage;
- fig. 3 is a cross-section of the sole in fig. 2 along a longitudinal plane III-III;
- fig. 4 is a view of the template positioned on the sole both cross-sectioned along a longitudinal plane;
- fig. 5 is a cross-section along a longitudinal plane, of the sole produced with the moulding system according to the invention. Before describing the operating stages of the moulding process according to the invention, it is important to remember that in order to realise the process according to the invention, the impression of the sole must be designed to ensure that the sole off the mould after complete and spontaneous shrinkage is slightly undersized with respect to the nominal dimensions of the size in question.

Moreover the impression of the mould must be designed so that the sole off the mould, regardless of its shape or pattern of the treading surface and its sides, has a series of perimeter holes on its upper surface.

This being so, the actual moulding process is attained according to current technology by injecting granules of expandable and cross-linking "EVA" compound into a mould, maintained at a specific temperature to ensure that during the time the material remains in the



Description

This patent application concerns an injection moulding process for soles in expandable and cross-linking "EVA" based compounds.

The patent protection is also extended to the sole obtained with the process according to the invention.

The abbreviation "EVA" refers to "vinyl-acetate ethylene copolymer" which, according to the type of additive used, may be thermoplastic or expandable and cross-linking.

In the case of the latter type, an expanding powder additive is used which decomposes at a specific temperature to produce gases which give rise to a typical phenomenon which occurs in injection moulding using this type of "EVA", consisting of the instantaneous expansion of the part as soon as the mould is opened.

In particular the dimensions of the part increase rapidly while the proportions and shape remain unaltered thus maintaining a ratio of perfect similarity with the impression of the matrix.

Expandable and cross-linking "EVA", thanks above all to its low cost, is widely used in the footwear sector for the production of inexpensive injection moulded soles.

It is not however currently possible with this material to mould soles with a raised trim along the sides since the expansion of the part when the mould is opened requires the perimeter of the sole to be milled in order to reduce the sole to the necessary dimensions.

In other words, since it is not possible to control this expansion precisely, it is currently necessary to dimension - according to the expansion ratio of the material and that of its shrinkage during cooling - the impression of the mould so that the cooled moulded sole is slightly oversized with respect to the nominal dimensions of the sole sizes in question, which are obtained by milling away a surface layer of material along the entire perimeter of the sole.

It is thus obvious why this material and moulding system can not be used for soles which have a raised trim, such as a welt, a part or all of which would be removed when the sides of the sole are milled.

The purpose of this invention is to design an injection moulding process for soles made of expandable and cross-linking "EVA" that makes it possible to produce a perfectly sized sole and to eliminate the costs and limitations of the milling which is currently necessary to size soles made of expandable and cross-linking "EVA" compounds.

The process according to the invention derives from an idea for a solution which is, in general terms, exactly opposite to that on which current production techniques are based.

According to this innovative idea, based on the expansion ratio of the material and that of its shrinkage during cooling, the impression of the mould is designed so that the moulded sole is slightly undersized after cool-

ing and shrinkage with respect to the nominal dimensions of the size in question, which are however strictly respected by arresting the spontaneous shrinkage of the sole during cooling.

For this purpose, the process according to the invention involves the use of a template consisting of a thin and flexible plate of rigid material placed during cooling so as to adhere on the moulded sole which in turn has a raised perimeter edge along its upper surface, that surrounds and holds the edge of the template before cooling is completed, thereby preventing additional shrinkage of the sole whose dimensions reduce no further either during or after cooling.

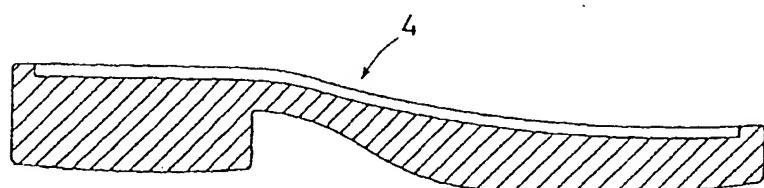
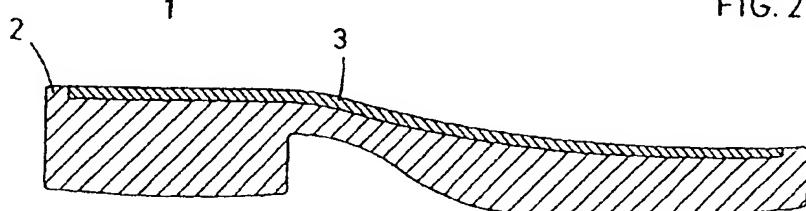
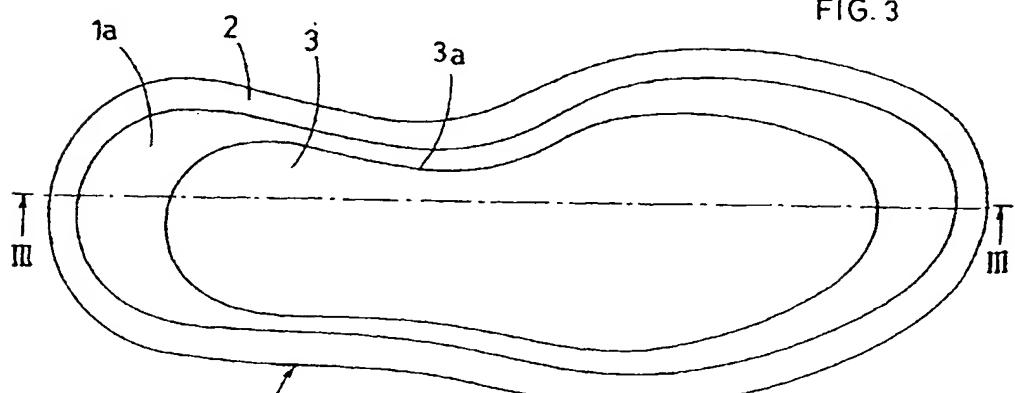
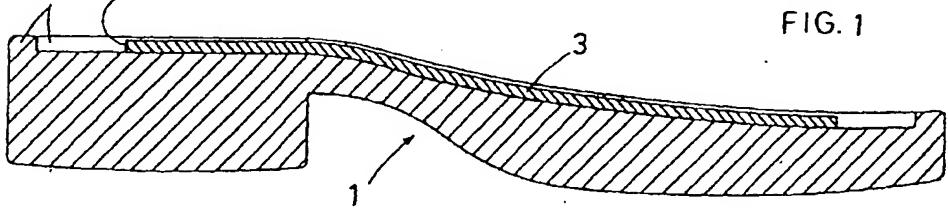
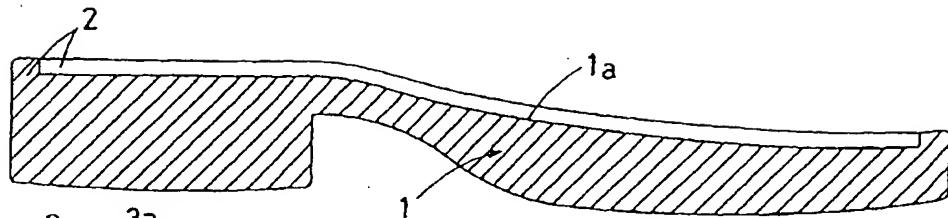
For major clarity the description of the process according to the invention continues with reference to the enclosed drawings which are intended for purposes of illustration and not in a limiting sense and which schematically show the moulded sole before and after shrinkage following cooling, whereby:

- fig. 1 is a cross-section along a longitudinal plane of the sole injected with expandable and cross-linking "EVA" compounds immediately off the mould in maximum expansion dimensions;
- fig. 2 is a top view of the sole in fig. 1 on which the template designed to arrest the spontaneous shrinkage of the sole during the post-moulding cooling stage, is placed;
- fig. 3 is a cross-section of the sole in fig. 2 along a longitudinal plane III-III;
- fig. 4 is a cross-section along a longitudinal plane of the sole according to the invention at the stage in which the perimeter edge of the sole and template join, during the spontaneous shrinkage phase;
- fig. 5 is a cross-section along a longitudinal plane of the sole produced with the moulding system according to the invention.

Before describing the operating stages of the moulding process according to the invention, it is important to remember that in order to realise the process according to the invention, the moulding system must be designed to ensure that the sole off the mould after complete and spontaneous shrinkage is slightly undersized with respect to the nominal dimensions of the size in question. Moreover the impression of the mould must be designed so that the sole off the mould, regardless of its shape or pattern of the treadng surface and sides, has a raised perimeter edge on its upper surface.

This being so, the actual moulding process is attained according to current technology by injecting granules of expandable and cross-linking "EVA" compound into a mould, maintained at a specific temperature to ensure that during the time the material remains in the mould, cross-linking and decomposition of the expanding filler, occur.

This conventional moulding phase produces a sole of the type illustrated in figure 1 which, as mentioned



Description

This patent application concerns a moulded plastic sole which is provided on its upper surface with a pliable cushion which also ensures forced ventilation of the inner section of the shoe as a result of the alternating pressure of the user's foot on the same as he or she walks.

The sole in question is designed to ensure forced circulation of air in a closed shoe so that the foot can transpire properly.

It is common knowledge that in conventional closed shoes with plastic sole the foot does not transpire properly with the risk of skin irritation and peeling; this becomes even more of a problem for those who tend to sweat heavily.

As a matter of fact this problem has already been faced with techniques which are undoubtedly more sophisticated and costly, the most common of which require radical modification to the structure of the rubber sole itself.

The soles which to date ventilate the foot generally have a hollow at the front of the sole designed to house a conforming insert which pumps air as well as a chamber through which the air drawn into the shoe is evacuated, generally on the heel; it being provided that these two hollows intercommunicate by means of a series of longitudinal air passages in the sole at approximately the level of the shank.

The air drawn into the shoe by the opposing pumping insert is then conveyed into the longitudinal air ducts and from these flows into the chamber positioned on the heel from which it is evacuated to the exterior of the shoe through one or more breather holes opening on the sides of the heel.

As far as the pumping element is concerned, it should be noted that to date on the most commonly used models the same is realised in rather soft materials and is fitted with a closely fitted series of pliable hollow fingers each of which is provided with a respective hole through which air is drawn into the inner section of the shoe.

The energetic pressure placed on these fingers by the sole of the foot due to the impact of the shoe on the treading surface compresses the same thereby forcing the air out into the longitudinal air passages which in turn convey the air to the evacuation chamber.

It is evident that each finger of the above pumping insert elastically resumes its shape as soon as the foot lifts from the ground; obviously this expansion again forces air into each hollow finger which is again forced out as described above when the shoe is again pressed against the treading surface.

The sole according to the invention is a valid alternative to this tried and tested technique in that it provides the same practical result with a less sophisticated and consequently less costly structure which is easier to produce.

In particular the item according to the invention supercedes the prior manufacturing principle requiring two separate hollows (at the front to house the pumping insert and at the back for the evacuation of air) joined and connected by one or more straight longitudinal air passages between the same.

In order to implement the inventive solution a single long cavity is provided on the upper surface of a plastic moulded sole; this cavity extends from the middle of the front section to the heel including the shank area without any gaps.

For most of its length from the front end, said cavity houses an innovative conforming pumping insert; while the rear section of the cavity, namely that on the heel, acts as evacuation chamber.

For this reason the rear section of the cavity in question is connected to the exterior by one or more breather holes realised in the preferred embodiment on the front vertical edge of the heel.

In this regard, the innovative pumping insert consists of a pliable and elastic plastic cushion provided in the interior with a series of rectilinear ducts each of which communicates with the exterior by means of a series of holes realised on the upper surface of the cushion.

As mentioned previously, said cushion is housed in the long section of the above cavity which covers the front area of the sole and shank; it being provided in particular that the inner ducts are positioned parallel to the longitudinal axis of the sole.

Moreover, the cushion is shaped and dimensioned to fit perfectly with a slight pressure into the section of the cavity in question; this perfect fit prevents unwanted sliding of the cushion in the respective housing and consequently ensures absolute stability in the sole according to the invention.

The ducts provided in the cushion in question produce a pumping action which in the conventional models was produced by the yielding fingers.

When the cushion housed in the sole according to the invention is pressed by the weight of the foot, the air in the inner ducts is forced out and when the sole is lifted from the treading surface the inner ducts spontaneously resume their original shape and are again filled with air through the series of holes provided therefor.

In this regard it should be noted that the air in the inner ducts of the pumping insert in question can escape only through the rear section of the cavity, which is the only cavity not occupied by the cushion.

For the remaining perimeter in fact of the pumping insert the ends of the ducts are "sealed" by the vertical walls of the housing which prevents air from escaping and consequent loss of pressure.

This means that the air expelled from the cushion, thanks also to the longitudinal positioning of its inner ducts, can only be forced into the evacuation chamber provided on the heel of the sole according to the invention.

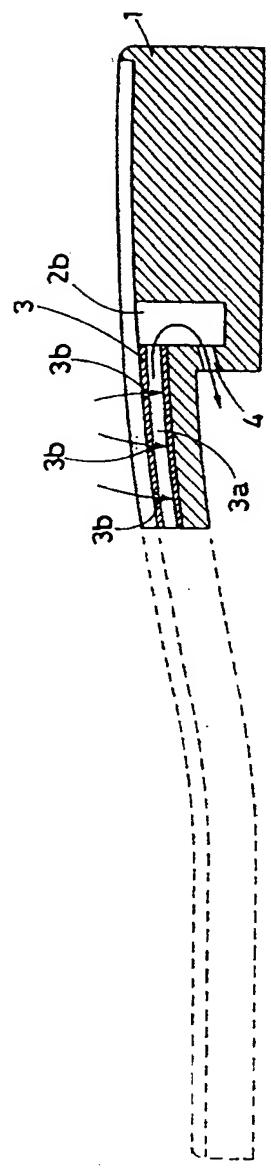


FIG. 2

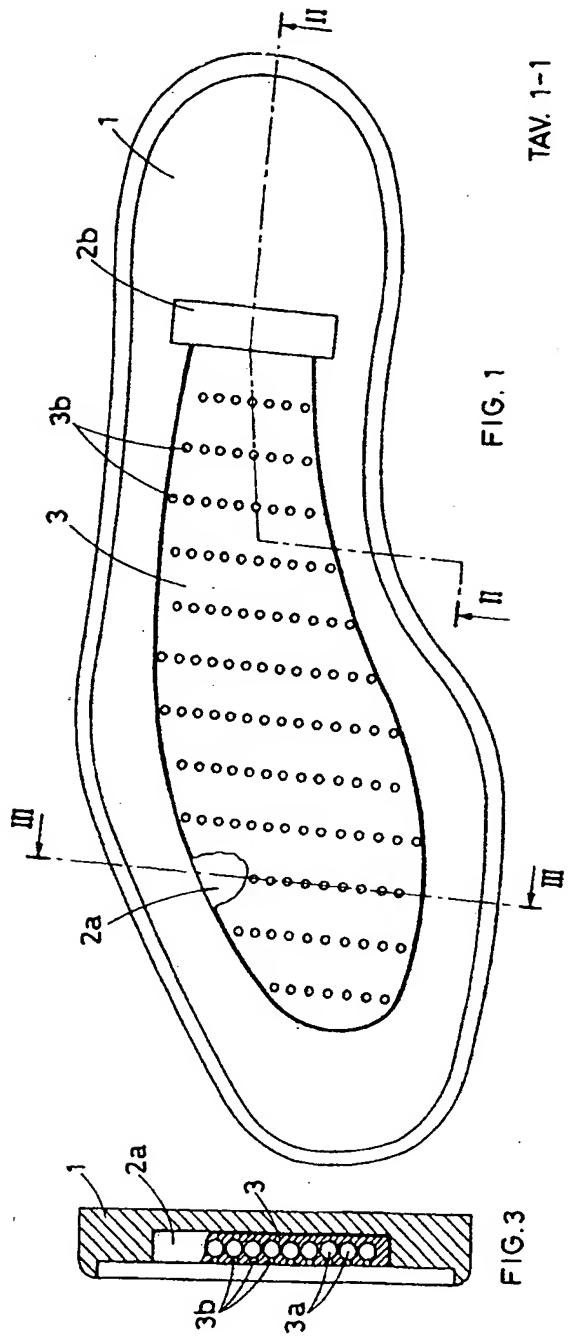


FIG. 1

TAV. 1-1

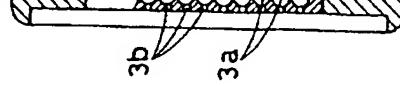


FIG. 3

(19) RÉPUBLIQUE FRANÇAISE
INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE
PARIS

(11) N° de publication :
(à établir que pour les
commandes de reproduction)

2 595 213

(21) N° d'enregistrement national :

86 03621

(51) Int Cl[°] : A 43 B 3/12.

(12)

DEMANDE DE BREVET D'INVENTION

A1

(22) Date de dépôt : 6 mars 1986.

(71) Demandeur(s) : SERVE Eric — FR.

(30) Priorité :

(72) Inventeur(s) : Eric Serve.

(43) Date de la mise à disposition du public de la
demande : BOP¹ « Brevets » n° 37 du 11 septembre 1987.

(73) Titulaire(s) :

(60) Références à d'autres documents nationaux appa-
rentés :

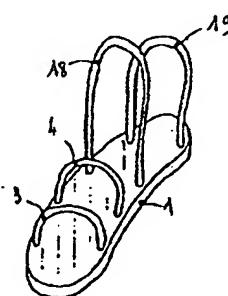
(74) Mandataire(s) : Jean Maisonnier.

(54) Sandale.

(57) L'invention concerne une sandale, dont la semelle 1 vient
s'adapter sous le pied.

Les arceaux 3, 4, 18, 19 sont en une lanière de mousse
souple, et qu'on peut allonger élastiquement. On croise les
arceaux 18 et 19 autour de la cheville, après les avoir allongés
élastiquement pour chauffer la sandale.

Application : suppression de toute boucle et de tout lacage;
confort et maintien du pied; possibilité d'utiliser la sandale
dans l'eau.



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convexe, rectangulaire, ou triangulaire.

Suivant une autre caractéristique, chaque sangle a ses extrémités collées ou soudées sur la semelle.

5 Suivant une autre caractéristique de l'invention, chaque extrémité d'une sangle traverse l'épaisseur de la semelle, dans une ouverture où elle est fixée par une agrafe.

10 Le dessin annexé, donné à titre d'exemple non limitatif, permettra de mieux comprendre les caractéristiques de l'invention.

Figure 1 est une vue d'une sandale selon l'invention.

15 Figure 2 montre un pied chaussé de cette sandale.

Figures 3,5,7 montrent trois autres variantes de sandales.

Figures 4,6 et 8 montrent respectivement ces variantes portées par un utilisateur.

20 Figure 9 montre une agrafe prête à recevoir l'extrémité de sangle dont elle assurera la fixation.

Figure 10 est une vue de l'agrafe développée à plat, par exemple lorsqu'elle est fabriquée en tôle découpée et pliée.

25 Figure 11 est une perspective en coupe montrant le détail d'une sangle fixée dans la semelle par une agrafe selon les figures 9 et 10.

La sandale illustrée sur les Fig. 1 et 2 comprend une semelle 1 qui peut être en toute matière synthétique connue, et notamment en une mousse de matière plastique semi-rigide. Sur cette semelle 1 sont fixés, chacun par ses deux extrémités 2, trois arceaux 3,4 et 5. Chacun des arceaux 3,4,5 est en une mousse d'une matière à la fois molle et élastiquement extensible, par exemple une mousse de caoutchouc ou de matière plastique. Bien entendu, chaque arceau peut être ou non renforcé intérieurement. Sa section transversale peut être quelconque, par exemple ronde ou ovale.

30 Un cas simple consiste par exemple à tronçonner chaque arceau 3,4,5, dans une lanière de mousse de longueur indéfinie..

L'utilisateur engage l'avant de son pied 6 sous les arceaux avant 3 et 4. Ensuite, il tire vers l'arrière l'arceau 5 qui s'allonge et il le laisse revenir élastiquement au-dessus de l'arrière de son talon 17. Désormais, le pied 6 se trouve donc fixé et maintenu sur la semelle 1 par une légère tension élastique des arceaux 3,4,5. On a vu que cette sandale est dépourvue de tout accessoire de réglage ou de fermeture, boucle, lacet ou analogue. Elle maintient parfaitement le pied sans le blesser et peut être utilisée notamment dans l'eau ou pour le plein air. Elle convient pour la pratique de sport tels que la planche à voile.

On a représenté sur les Fig. 3 et 4 une variante où l'arrière de la semelle 1 comporte, non plus un seul arceau 5, mais deux arceaux 18 et 19 qui, au repos (Fig. 3) sont placés l'un devant l'autre.

En service, l'arceau avant 18 est rabattu vers l'arrière, derrière le sommet du talon 17 (Fig. 4), alors qu'au contraire l'arceau arrière 19 est rabattu vers l'avant pour s'adapter sur le cou 20 du pied 6. Ainsi, sur le pied 6 de l'utilisateur, les deux arceaux 18 et 19 se croisent au voisinage des chevilles, ce qui assure au pied 6 un maintien particulièrement efficace.

Dans la variante des Fig. 5 et 6, l'arrière de la semelle 1 comporte deux arceaux de mousse élastique 21 et 22 qui présentent la particularité suivante :
 - les deux extrémités 2 de l'arceau 21 sont fixées l'une devant l'autre sur le côté droit de la semelle 1;

- les deux extrémités 2 de l'arceau 22 sont fixées l'une devant l'autre sur le côté gauche de la semelle 1.

Ainsi, sur le pied 6 de l'utilisateur les sommets des deux arceaux 21 et 22 se croisent à la fois derrière le talon 17 et devant le cou de pied 20.

Dans la variante des Fig. 7 et 8, l'arrière de la semelle 1 porte deux arceaux élastiques 23 et 24 qui se croisent (Fig. 7) alors que chacun a une extrémité 2 sur le côté droit de la semelle 1, et une extrémité 2 sur le côté gauche. Ainsi, sur le pied 6 de l'utilisateur, les

REVENDICATIONS

1- Sandale comprenant une semelle (1) surmontée par des sangles qui en sont solidaires, caractérisée en ce que chaque sangle est constituée par un arceau dont chacune des deux extrémités (2) est définitivement fixée à la semelle (1), l'une au moins de ces sangles étant en une mousse élastique qui permet de l'allonger au moment du chaussage.

2- Sandale suivant la revendication 1, caractérisée en ce que toutes les sangles sont en une mousse élastique souple d'une matière élastique synthétique.

3- Sandale suivant l'une quelconque des revendications précédentes, caractérisée en ce que chaque sangle souple a une section transversale convexe ovale, rectangulaire ou triangulaire.

4- Sandale suivant l'une quelconque des revendications précédentes, caractérisée en ce que chaque extrémité (2) de chaque sangle est soudée ou collée sur la semelle (1).

5- Sandale suivant l'une quelconque des revendications 1 à 3, caractérisée en ce que chaque extrémité (2) de chaque sangle est fixée à la semelle (1) par une agrafe (7) qui comporte un manchon cylindrique (14) pourvu d'une languette intérieure (10) pour l'ancrage de l'extrémité (2), et une patte extérieure (11) pourvue d'une languette d'ancrage (13) à incruster dans la semelle (1).

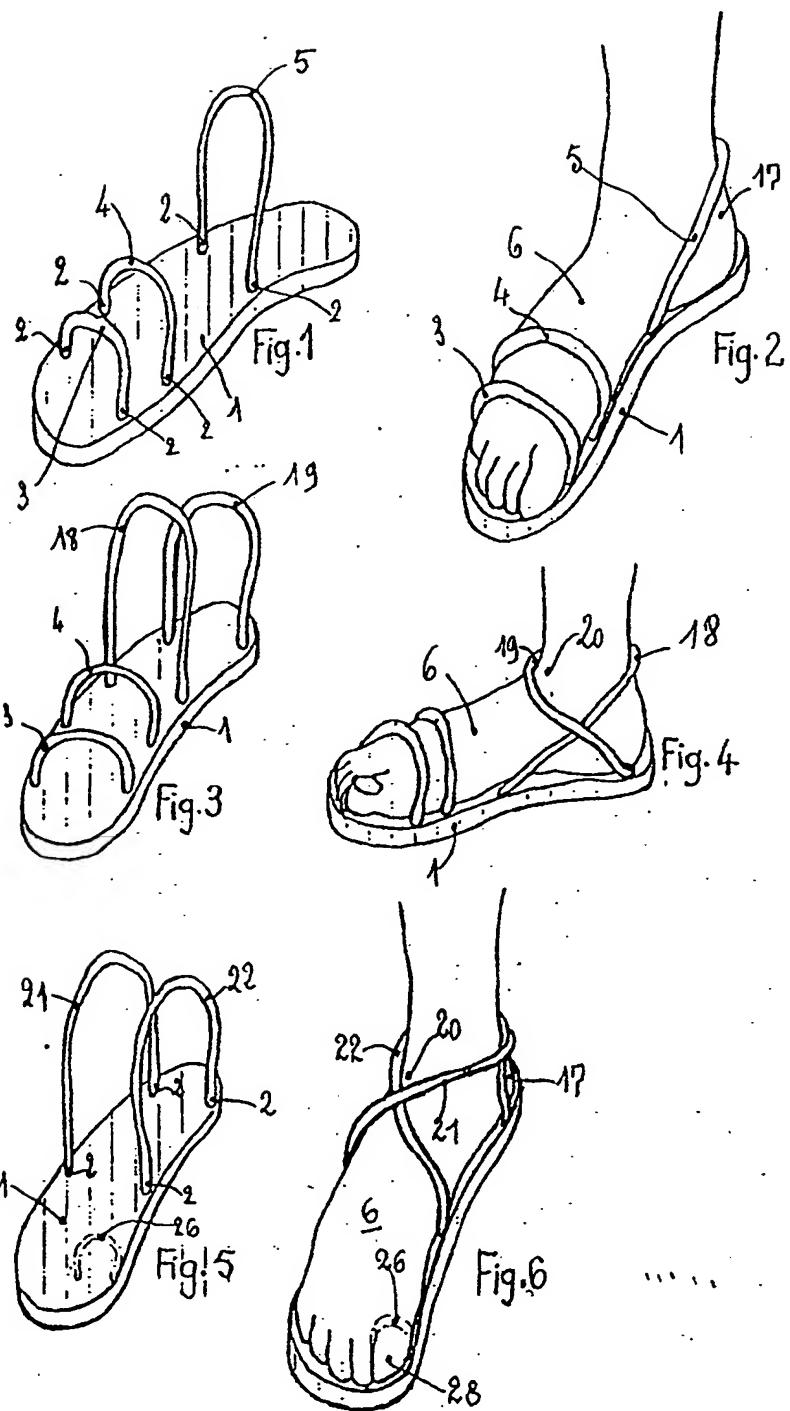
6- Sandale suivant l'une quelconque des revendications précédentes, caractérisée en ce qu'elle comporte un seul arceau élastique (5) à l'arrière de la semelle (1), prévu pour passer derrière le haut du talon (17) de l'utilisateur.

7- Sandale suivant l'une quelconque des revendications 1 à 5, caractérisée en ce qu'elle comporte deux arceaux élastiques (18) et (19) fixées transversalement l'un devant l'autre sur l'arrière de la semelle (1).

8- Sandale suivant l'une quelconque des revendications 1 à 5, caractérisée en ce qu'elle comporte deux arceaux élastiques (21) et (22), fixés face à face, l'un (21) sur le côté droit de l'arrière de la semelle (1),

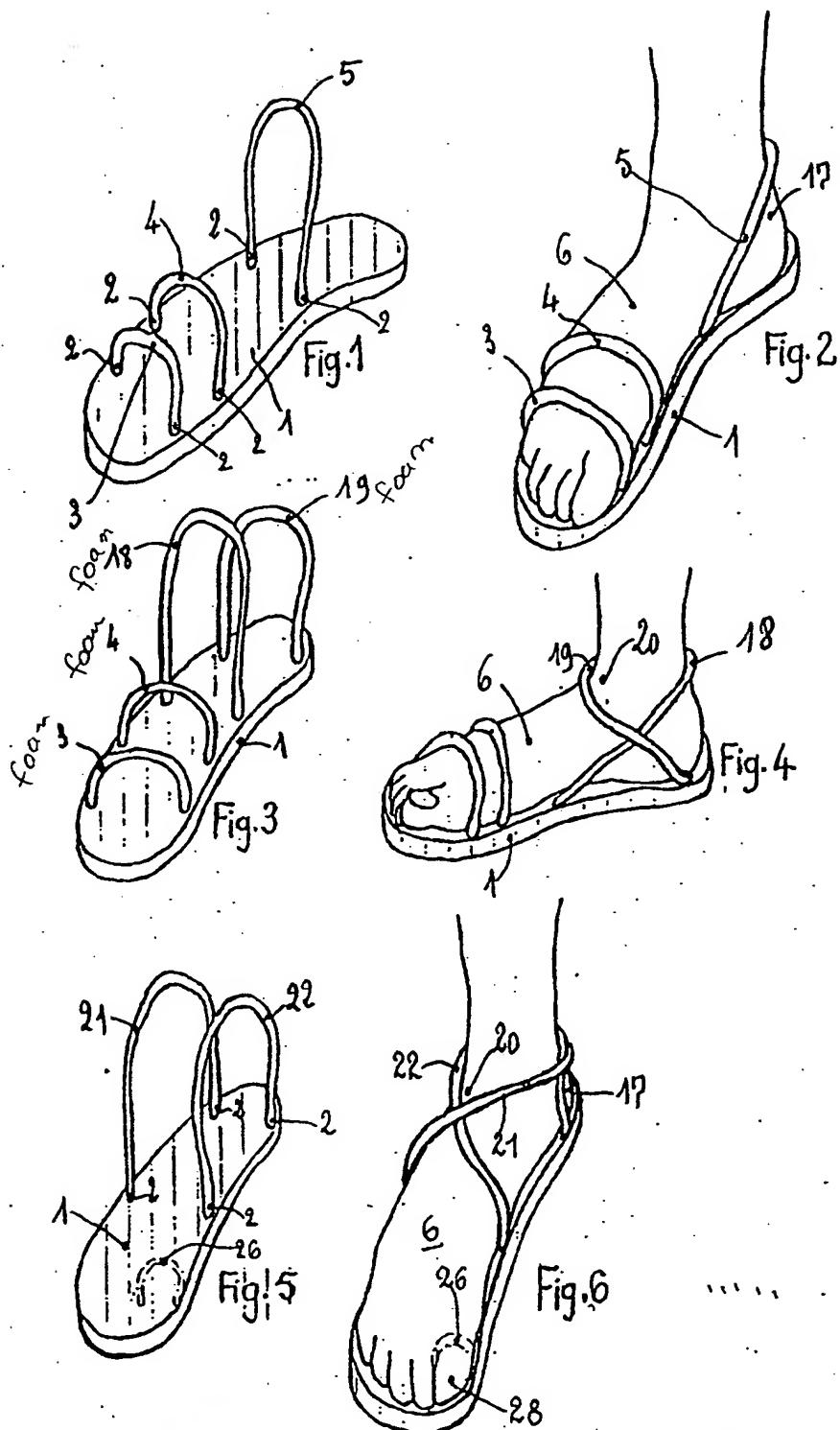
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PTO 05-6075

CY=FR DATE=19870911 KIND=A1
PN=2 595 213

SANDAL
[SANDALE]

side/stap upper/strand
Connector
foam
gluing/welding
clamps

Eric Serve

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. September 2005

Translated by: FLS, Inc.

The present invention relates to a new type of sandal and, more /1 specifically, to a sandal that can be used equally well on dry land or in the water.

Sandals are known that are made up of a sole of synthetic material, topped with straps that are provided to circle and hold the foot.

These known sandals have various disadvantages.

In a first category, the sandal comprises one or several straps intended to circle the ankle or the heel. These non-extendable straps are equipped with locking means, a buckle or the like, while using them makes it necessary to carry out an operation and an adjustment.

In another category, the sandal comprises loops of fixed lengths, under which the user engages the front of the foot or even one or several toes. Thus the user's heel is not held at the back of the sole.

In any case, the majority of the known sandals hurt or wound the foot, above all when it is wet. This is especially the case in certain sandals where the loops pass between two toes.

The object of the present invention is to prevent these disadvantages by producing a sandal that does not wound the foot, while holding the foot properly on the sole and doing so even if the foot is simultaneously bare and wet.

A sandal according to the invention comprises a sole of synthetic material topped by straps that are attached to it and is characterized

¹Numbers in the margin indicate pagination in the foreign text.

Figure 11 is a perspective cross section view showing the detail of a strap fastened in the sole by a clamp according to Figs. 9 and 10.

The sandal shown in Figs. 1 and 2 comprises a sole 1 that may be of any known synthetic material, and in particular a foam of semi-rigid plastic material. Three loops 3, 4 and 5 are fastened on sole 1, each by its two ends 2. Each of the loops 3, 4, 5 is made of a foam of a material that is simultaneously soft and elastically extendable, for example a foam of rubber or plastic material. Naturally, each loop may be reinforced on the inside, or not. Its transverse cross section may be of any shape, for example round or oval.

A simple case consists, for example, of cutting each loop 3, 4, 5, from a foam strap of undefined length stored on a bobbin.

/3

In any case, each loop offers the foot 6 of the user a soft and flexible contact that does not wound or injure the skin, even after prolonged use. In addition, the shoe produced in this way remains insensitive to water.

Each end 2 of the strap can be fastened on sole 1 by any known system, in particular by gluing or welding. It is also possible to produce a clamping of the type illustrated in Figs. 9 to 11.

In this case, it is possible to use a clamp 7 (Figs. 9 and 11) obtained by rolling and folding a blank of sheet metal 8 (Fig. 10). This blank 8 comprises a rectangular element 9 into which a pointed tongue 10 is cut. This element is extended by a tab 11 provided with a pointed end 12, into which another tongue 13 is cut. The points of the

or outside. It is suitable for sports such as sail boarding.

Figs. 3 and 4 show a variation where the back of the sole 1 comprise, not just single loop 5, but two loops 18 and 19 that are placed one in front of the other at rest (Fig. 3).

In service, the front loop 18 is folded toward the back, behind the top of the heel 17 (Fig. 4), while in contrast the back loop 19 is folded toward the front to adapt itself to the instep 20 of the foot 6. Thus, on the foot 6 of the user, the two loops 18 and 19 cross in the area of the ankle, which ensures a perfectly effective holding for foot 6.

In the variation in Figs. 5 and 6, the back of the sole 1 comprises two loops 21 and 22 of elastic foam that have the following special characteristics:

- the two ends 2 of the loop 21 are fastened one in front of the other on the right side of the sole 1;
- the two ends 2 of the loop 22 are fastened one in front of the other on the left side of the sole 1.

Thus, on the foot 6 of the user, the tops of the two loops 21 and 22 simultaneously cross behind the ankle 17 and in front of the instep 20.

In the variation in Figs. 7 and 8, the back of the sole 1 has two elastic loops 23 and 24 that cross (Fig. 7) while each has one end 2 on the right side of the sole 1 and one end 2 on the left side. Thus, on the foot 6 of the user, two loops 23 and 24 cross at a single point

sole (1) by a clamp (7) that comprises a cylindrical sleeve (14) provided with an inner tongue (10) for anchoring the end (2) and an outer tab (11) provided with an anchoring tongue (13) for embedding into the sole (1).

6. Sandal according to any one of the preceding claims, characterized in that it comprises a single elastic loop (5) at the back of the sole (1) provided for passing behind the top of the heel (17) of the user.

7. Sandal according to any one of the preceding claims, characterized in that it comprises two elastic loops (18) and (19) fastened laterally, one in front of the other, on the back of the sole (1).

8. Sandal according to any one of the preceding claims, characterized in that it comprises two elastic loops (21) and (22), fastened facing each other, one (21) on the right side of the back of the sole (1), the other (22) on the left side of the sole (1). /7

9. Sandal according to any one of the preceding claims, characterized in that on the back of the sole (1) it comprises two elastic loops (23) and (24) that cross, while each has one end (2) on the right side of the sole (1) and one end (2) on the left side.

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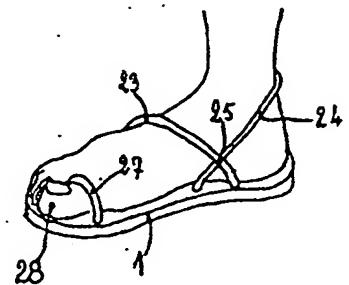
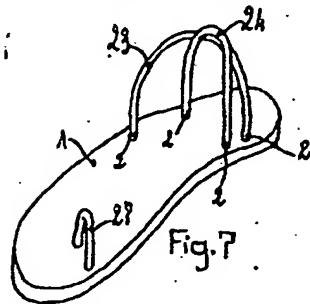
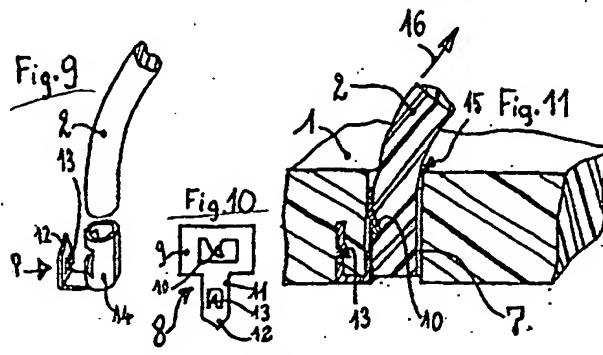


Fig. 8

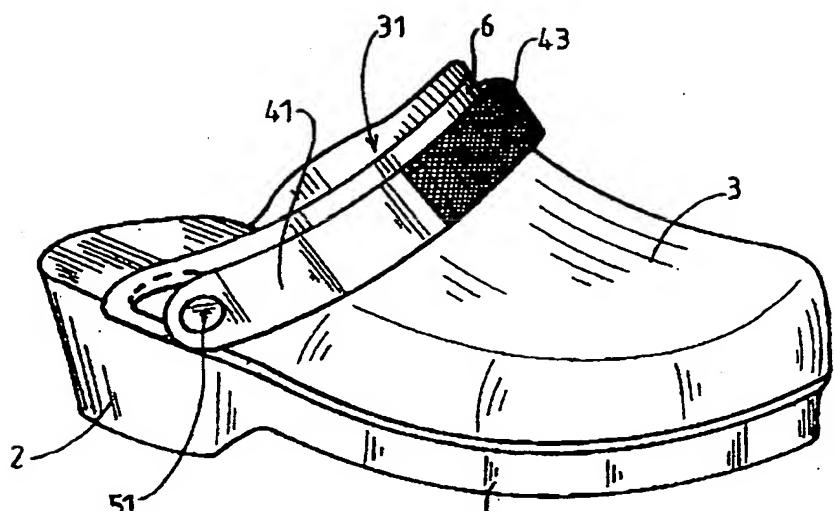


FIG.1

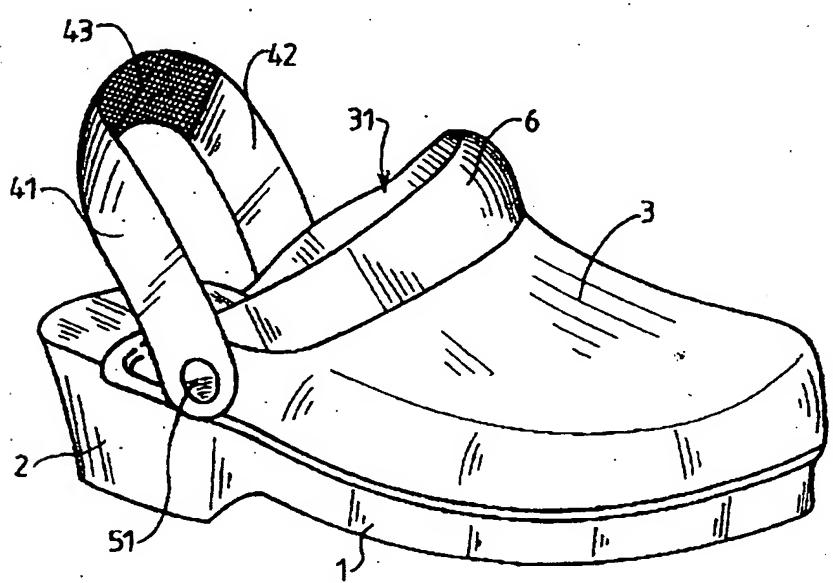


FIG. 2

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The present invention relates to an item of footwear in the form of a clog

- closed at the front and open at the rear,
comprising a strap connected at each end by a rivet to the upper of the clog.

Items of footwear or clogs of that type are already known and are used mainly indoors by people walking a great deal in the course of their work, such as, for example, hospital staff.

Such a clog has the disadvantage of having a strap of adjustable or adaptable length whose metal buckle is in contact with the foot. The same applies to the rivet part of the strap, facing the interior of the clog.

Under the effects of perspiration, the metal parts, even when treated, rust or irritate the skin.

The aim of the present invention is to provide an item of footwear of the type defined above which is simple to produce and use and does not include any parts likely to irritate the skin.

To that end, the invention relates to an item of footwear of the type defined above, characterised in that the strap, which is at least partially extendable, is fixed at each end to a pivot rivet in order to move from a retracted position on the clog upper, affording free access to the clog, to a deployed position at the rear in which it encloses the heel.

According to another very advantageous feature, the strap, which is at least partially extendable, is formed by two

- Figure 3 is a partial, perspective view towards the interior of the item of footwear,
- Figure 4 is a horizontal, partial sectional view of the upper of the item of footwear in the region of a rivet,
- Figure 5 is a vertical, partial sectional view of the upper of the item of footwear in the region of a rivet.

According to the Figures, the item of footwear in the form of a clog comprises a sole 1 having a heel 2; the front and the upper 3 form a cavity in which the front of the foot is accommodated. On the other hand, the ankle and the heel remain free. The upper may be solid or openworked.

The upper 3 is provided with a strap formed by three portions, two lateral portions 41, 42 and an intermediate portion 43. The lower end of the lateral portions 41, 42 is connected by a rivet 51, 52 to the upper 3 of the shoe. The other end of the lateral portions 41, 42 is connected to the intermediate portion 43. The intermediate portion 43 is elastic, for example a piece of elastic arranged in an outer sleeve having stitched gathering. Therefore, the strap can be moved from the position in Figure 1 to the position in Figure 2, and vice versa.

The elasticity of the portion 43 is sufficient to hold the strap in its retracted position (Figure 1) or to move it to its active position (Figure 2) in which it encloses the rear of the foot.

The mouth 31 of the upper 3 is edged by padded trim 6 comprising a strip of supple material, folded back upon itself and fixed along the edge of the upper 3 to form a large, supple contact surface, avoiding irritation of the skin at this very stressed position.

CLAIMS

1. Item of footwear in the form of a clog
- closed at the front and open at the rear,
comprising a foldable strap connected at each end by a
rivet to the upper (3) of the clog,
characterised in that
the strap, which is at least partially extendable, is
fixed at each end to a pivot rivet (51, 52) in order to
move elastically from a retracted position on the upper
(3), affording free access to the clog, to a deployed
position at the rear in which it encloses the heel.
2. Item of footwear according to claim 1,
characterised in that
the strap, which is at least partially extendable, is
formed by two lateral, non-extendable portions (41,
42), each fixed at one end to a pivot rivet (51, 52),
and an intermediate, elastic portion (43).
3. Item of footwear according to claim 1,
characterised in that
the rivet is covered on the inside of the item of
footwear by a protective layer.
4. Item of footwear according to any of claims 1 to 3,
characterised in that
the opening of the cavity (31) of the clog is
surrounded by padded trim (6), fixed to the inside of
the opening along its edge, and the trim (6) surrounds
the inner head (522) of each rivet (52, 51).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number
WO 2004/105531 A1

(51) International Patent Classification⁷: A43B 3/12, B29C 45/26, B29D 31/515

(21) International Application Number: PCT/US2004/015132

(22) International Filing Date: 14 May 2004 (14.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/473,360	23 May 2003 (23.05.2003)	US
60/473,371	23 May 2003 (23.05.2003)	US
10/602,416	23 June 2003 (23.06.2003)	US
10/603,126	23 June 2003 (23.06.2003)	US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GI, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

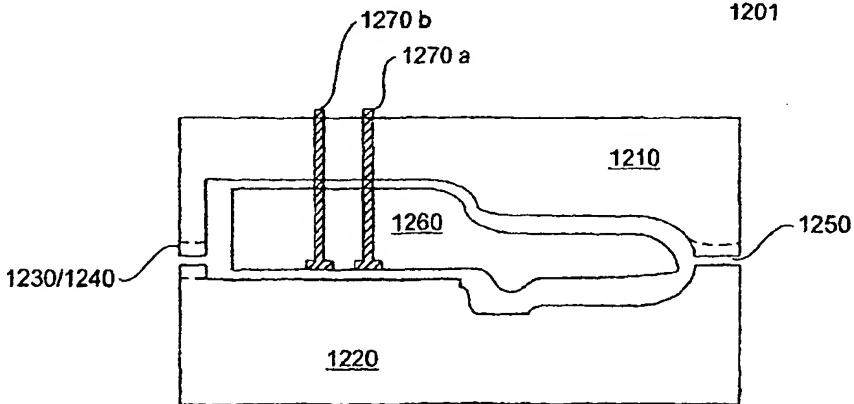
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIGO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SI, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FOOTWEAR MOLDS



WO 2004/105531 A1

(57) Abstract: Among other things, the present invention provides apparatus and methods for manufacturing footwear pieces. In various cases, the apparatus includes a footwear form (1260) that includes a location mark corresponding to a location of a strap rivet. The footwear form is an inner portion of a footwear mold, and the footwear mold is comprised of an upper portion (1210) and a lower portion (1220) that substantially encompass the footwear form.

In some instances, a location mark extending from the footwear form causes a reduced amount of molding material to form at the location of the location mark. In particular cases, this can result in a hole or an indentation in a formed footwear piece at the location where the rivet associated with a strap on the footwear piece is to be attached. In other instances, the 5 location mark extends into the footwear form such that an increased amount of molding material forms at the location where the rivet associated with a strap on the footwear piece is to be attached. Thus, for example, a raised "X" shaped mark may result from use of the footwear form. In some cases, the location mark further includes a halo section that roughly corresponds to the size of a rivet head upon expansion of a material forming an expanded 10 footwear piece.

[0008] In some cases, the footwear form is an inner portion of the footwear mold, and the footwear mold further includes an upper portion and a lower portion that at least substantially encompass the footwear form. The upper and/or lower portions can include molding material inlets capable of accepting molding material that will be formed into footwear pieces. In 15 various cases, the footwear form is suspended from the interior of the upper portion.

[0009] Other embodiments of the present invention provide methods for manufacturing footwear molds. Such methods include forming a location mark in a footwear form. This footwear form can be, for example, an inner portion of a three piece mold. Further, the location mark can include a halo, and the method can include locating an outer edge of the 20 halo approximately even with a pattern corresponding to an inner wall of a footwear piece, and/or locating an outer edge of the halo set-off from an outer edge of the footwear piece. In one particular embodiment, the outer edge is set-off approximately one sixteenth inch from an edge of the footwear piece after expansion of the footwear piece.

[0010] Some embodiments of the present invention provide molds for manufacturing 25 sectional shoe pieces that include a base section and a strap section. The base section includes an upper and a sole formed as a part. The strap section is formed as a second part that is attached to the base section such that the strap pivots relative to the base section. In some instances, the base section is molded of a continuous piece of foam material. Such foam material can be a lofted material manufactured using a resin base. Where a resin 30 material is used, it can be mixed to exhibit an expansion coefficient, and a contraction coefficient. In particular cases, multiplying the expansion coefficient and the contraction coefficient results in a product, or a final growth value, of between 1.46 and 1.58, inclusively.

[0011] In various instances, the base section and the strap section are formed of the same material. Such material can be the aforementioned foam material formed into different

section, and does not interfere with inserting and removing a foot from the base section. Further, in some cases, the strap can be fixed in contact with either the upper opening perimeter or the rear sole perimeter.

[0015] In various cases, a number of ventilators are formed in the upper. Such ventilators 5 can be holes of varying sizes that allow liquid and/or air to pass through at prescribed locations in the upper. In some cases, such ventilators are formed in both a substantially horizontal portion of the upper and a substantially vertical portion of the upper. This provides for a significant amount of ventilation for applications where it is not necessary to protect the foot from exposure to liquids entering through the ventilators. Such applications 10 can include, but are not limited to, boating, beach use, fishing, and the like.

[0016] Alternatively, some instances include a solid covering over the substantially horizontal portion of the upper, while including ventilators formed in the vertical portions of the uppers. This provides for sufficient ventilation, while at the same time protecting a foot 15 from spilled liquids. Such an approach may be desirable for applications including use by medical personnel, chefs, and the like. Further, in some cases, a liquid conductor is formed around at least a portion of a perimeter of each of the plurality of ventilators. Such a liquid conductor transfers a liquid spilled on the upper around and away from the various ventilators formed in the substantially vertical portion. Such conductors can thus further protect the foot 20 from exposure to spilled liquids.

20 [0017] In particular cases, the toe region of the upper is extended at a location corresponding to the larger toes of the human foot. Thus, the toe region of the upper generally follows the contour of a human foot from larger toes on the inside of the shoe to smaller toes on the outside of the shoe. Such an approach can provide increased comfort and/or functionality. Further, the rear perimeter of the sole can be raised above a support 25 base further increasing the functionality of the shoe. This support base can include a raised pattern where the foot contacts the shoe.

[0018] One particular embodiment provides a piece of footwear that comprises a sole and an upper portion extending from the sole. The upper portion is adapted to cover the top of a user's foot and includes a rear opening for receiving the user's foot. At least one connector is 30 coupled to the upper portion, and a strap is operably coupled to the upper portion. The strap is configured to be positioned across the rear opening to engage the back of the user's foot. The piece of footgear also includes at least one adjustment mechanism that is interactable with the connector and the strap to adjust the position of the strap relative to the back of the user's foot.

Fig. 3 is a top view of the footwear piece of Fig. 1.

Fig. 4 is a front view of the footwear piece of Fig. 1.

Fig. 5 is a rear view of the footwear piece of Fig. 1.

Fig. 6 is a bottom view of the footwear piece of Fig. 1.

5 [0025] Fig. 7 is a perspective view of another footwear piece in accordance with another embodiment of the present invention.

Fig. 8 is a top view of the footwear piece of Fig. 7.

[0026] Fig. 9 is a flow diagram illustrating methods for manufacturing in accordance with embodiments of the present invention.

10 [0027] Figs. 10a and b illustrate another footwear piece in accordance with other embodiments of the present invention.

[0028] Figs. 10c and d illustrate the footwear piece of Figs. 10a and b, with an alternative coupling arrangement according to the present invention.

[0029] Fig. 11 illustrates yet another footwear piece in accordance with various

15 embodiments of the present invention.

[0030] Fig. 12a illustrates a footwear mold in accordance with various embodiments of the present invention.

Fig. 12b is a cross sectional side view of the mold of Fig. 12a.

Fig. 12c is a top view of the interior of a lower portion of the mold of Fig. 12a.

20 Fig. 12d is an interior view of an upper portion of the mold of Fig. 12a.

Fig. 12e illustrates one embodiment of a footwear form according to the invention.

[0031] Fig. 13 illustrates an imprint of a location mark in accordance with some

embodiments of the present invention.

25

DETAILED DESCRIPTION OF THE INVENTION

[0032] Among other things, the present invention provides various molds and methods for using such to manufacture footwear pieces. In various cases, the footwear pieces are molded from a lofted material. Further, in various cases, the footwear pieces include a pivoting strap that can be moved into contact with and fixed in relation to the sole of the footwear piece, or

30 moved into contact with and fixed in relation to the upper of the footwear piece.

[0033] Turning to Fig. 1, a footwear piece 100 in accordance with some embodiments of the present invention is illustrated. Footwear piece 100 includes a base section 110 and a strap section 120. Base section 110 includes an upper 150 and a sole 162. In some

contact an area of the human foot in front of, and below the ankle. Upper 150 can be designed such that upper opening perimeter 170 is disposed only a short distance from toe region 155, in which case it will be formed in substantially horizontal region 152.

Alternatively, upper 150 can be designed to extend farther up the foot toward the ankle, in 5 which cases it will be in a more vertical region of upper 150. A decorative pattern 190 may or may not be formed or created near upper opening perimeter 170. As depicted, upper opening perimeter 170 can extend from the location of rivet 131a to that of rivet 131b (shown in other figures).

[0038] Sole 162 includes a rear sole perimeter 160 that defines the rear portion of sole 160. 10 In some cases, this region is raised above a support base 165 that is the area that is in contact with the bottom part of the human foot. Such a raised rear sole perimeter provides some support to the heel of the human foot and helps maintain footwear piece 100 in position. In other embodiments, rear sole perimeter 160 is not raised.

[0039] Strap section 120 includes an outer region 122, an inner region 121, and rounded 15 ends 130. In some cases, strap section 120 is attached to base section 110 by rivets 131 that are placed through holes in both strap ends 130, and in upper 150 at an attachment point. Strap section 120 can be pivoted in relation to base section 110 such that strap section 120 can contact upper opening perimeter 170 when pivoted in one direction, and rear sole perimeter 160 when pivoted in the other direction. In some embodiments, strap section 120 20 includes dimensions such that when strap section 120 is pivoted forward, inner region 121 contacts an outer surface of upper opening perimeter 170. A frictional force at the contact of inner region 121 and upper opening perimeter 170 maintains strap section 120 in a fixed position relative to base section 110.

[0040] Alternatively, strap section 120 can include dimensions such that when strap section 25 120 is pivoted backward, inner region 121 contacts an outer surface of rear sole perimeter 160. A frictional force at the contact of inner region 121 and rear sole perimeter 160 maintains strap section 120 in a fixed position relative to base section 110. In such positions, strap 120 can be a decorative portion of footwear piece 100.

[0041] As yet another alternative, strap section 120 can be placed in an intermediate 30 position between rear sole perimeter 160 upper opening perimeter 170. In this position, the strap serves the utilitarian purpose of lending support to the Achilles portion of the human foot, thus helping to maintain footwear piece 100 in position on the human foot. In some embodiments, a frictional force developed between strap 120 and upper 150 at the location of the rivets is sufficient to maintain strap 120 in place. This helps to assure that strap 120

[0045] Fig. 9 is a flow diagram 900 illustrating a method in accordance with the present invention for manufacturing footwear pieces. Following flow diagram 900, a base section and strap section are molded (blocks 910, 920). The base section and strap section are perforated at the location where the two pieces are to be connected (blocks 930, 940). The 5 perforations in the strap and base section are aligned (block 950), a male portion of a rivet is inserted through the aligned perforations (block 960), and a female portion of the rivet is mated to the male portion, thus securing the strap to the base section.

[0046] Turning to Fig. 10a, another footwear piece 1000 in accordance with other 10 embodiments of the present invention is illustrated. Footwear piece 1000 is similar to previously described footwear piece 100, except that strap 120 has been modified to allow for adjustment. As illustrated, a strap 1120 includes a main portion 1121 and a connection portion 1160. Connection portion 1160 is attached to a base section 1110 of footwear piece 1000 by a rivet 1170, or some other pivotable (or even non-pivotal) connection as is known in the art. One end of main portion 1121 is attached directly to the footwear piece at its 15 opposite side. This may be done by a rivet (not shown) or some other type of connection. The other end of main portion 1121 includes a connector 1140, such as a length of a hook and loop fastener material, such as VELCRO. Connector 1140 includes a portion 1130 extending like a tongue from main portion 1121.

[0047] Portion 1130 is fed through a loop 1150 that is attached to or integrally formed with 20 connection portion 1160 and pulled until the desired tightness is achieved. As connection portion 1160 is pulled tighter, main portion 1121 is pulled tighter against the user's foot. Advantageously, this adjustment may happen while the user is wearing the piece of footgear. Portion 1130 is then laid over the part of connector 1140 that is attached to main portion 1121 as depicted in Fig. 10b. One of ordinary skill in the art will appreciate that other connection 25 materials can be used in place of VELCRO, such as snaps, hooks, clips, strings that are tied together, and the like. Further, based on the disclosure provided herein, one of ordinary skill in the art will appreciate that an adjustment mechanism (such as connection portion 1160 and connector 1140) can be used on either or both sides of strap 1120, or can be placed in the center of strap 1120 (with strap 1120 being formed into two sections).

[0048] As shown in Fig. 10c, footwear piece 1000 may be modified to include other ways 30 to adjust strap 1120. More specifically, a strip 1142 of material, such as a strip of durable fabric, may be coupled to strap 1120, such as by using one or more male snap members 1145. The other end of strip 1142 includes a female snap member 1135. Also coupled to footwear piece 1000 is a pivotable connection portion 1155 that is coupled using a rivet 1157 or other

appreciate that adjustable strap 1120 depicted in Figs. 10 can also be used in relation to footwear piece 1100.

[0053] As previously suggested, the footwear pieces disclosed herein can be made of a lofted foam material. Manufacturing footwear pieces using such a lofted foam material can 5 include providing a resin that includes a pre-mixture of resin, pigment, and a growth additive. The resin, originally in pellet form, is heated to a liquid state. This liquid resin is screwed into a mold that has been heated prior to receiving the resin. The volume of resin screwed into the mold is controlled by the pitch of the screw that drives the liquid resin into the mold. The liquid resin is allowed to set, at which time the mold is opened and the formed footwear 10 piece is removed from the mold. The formed footwear piece is then placed on a cooling last, where it is allowed to air dry.

[0054] During this process, a relatively small footwear piece conforming to the size of the mold is created, but when the mold opens, the footwear piece springs out as it expands in size. Then, as the footwear piece is air cooled, it contracts to a final size. Thus, the process 15 involves both an expansion characteristic and a contraction characteristic. Multiplying the size of the footwear piece in the mold by the expansion characteristic yields the size of the footwear piece after the mold is opened. Multiplying the expansion characteristic by the contraction characteristic provides a final growth value representative of the final size of the shoe relative to the mold.

20 [0055] In such a manufacturing process, a number of elements can be controlled to achieve the desired end result. These elements include, the volume of material introduced into the mold, the size of the mold, the composition of the material being used, and the size of the cooling last. Previous manufacturers of molded footwear products have used, for example, four sizes of molds to create six different sizes of footwear pieces. Thus, for example, to 25 create two different sized shoes from the same mold, one volume of a material is screwed into a mold to create one shoe size, and another volume of the same material is screwed into the same mold to create a different shoe size. Once removed from the mold, the shoes are cooled on cooling lasts of different sizes. Thus, the process uses a modified volume and cooling last size to control the end product, while keeping the mold size and the composition 30 fixed. While this creates shoes of different sizes, it has been found that control of the final sizes is somewhat limited and/or unpredictable.

[0056] In part to address this, embodiments of the present invention use a fixed volume and composition of material, and cooling last size, while varying mold sizes to control the size of the end product. It has been found that such an approach results in a heightened degree of

and a lower portion 1220. Semicircular inlets 1230, 1240 are formed in both the upper portion 1210 and lower portion 1220 to allow for inserting molding material into mold 1200. One of ordinary skill in the art will recognize that full circle inlets in either the top or the bottom can also be used. Attachment screws 1270a, 1270b are also included to suspend a 5 footwear form from the interior of footwear mold 1200 as more fully described below. As illustrated, upper portion 1210 and lower portion 1220 come into contact at location 1250. In one case, attachment screws 1270a, 1270b are not threaded, but rather are cylindrical with a clamp attachment groove cut into the end of attachment screws 1270 secured to the outer side of upper portion 1210. Further, attachment screws 1270 include a head region that mates 10 with an internal footwear form (see Fig. 12b below).

[0061] Fig. 12b shows a cut away cross section 1201 of footwear mold 1200. Cross section 1201 depicts a footwear form 1260 suspended within the interior formed by the combination of upper portion 1210 and lower portion 1220. Fig. 12c shows a top view 1202 of the interior of lower portion 1210. As illustrated, left and right shoe soles 1275a, 1275b are formed by 15 inserting molding material through inlets 1230, 1240. Fig. 12d illustrates an interior view 1203 of upper portion 1220 showing the molding pattern for left and right uppers 1280a, 1280b of a footwear piece.

[0062] Fig. 12e illustrates a footwear form 1260 including outer and inner location marks 1290a, 1290b in accordance with some embodiments of the present invention. As illustrated, 20 location marks 1290 include two posts that extend out from footwear form 1260. When a footwear piece is molded, less molding material is formed at the location of location marks 1290 creating a hole or indentation in the upper of the footwear piece. A rivet connecting a strap to the upper is forced through the upper at the indented or open area formed by location marks 1290. In other example, location marks 1290 could be indents in footwear form 1260 25 causing excess material to be formed at the location where the strap is to be attached. While not illustrated, individual footwear forms 1260 are formed to match each of left and right uppers 1280a, 1280b, and soles 1275a, 1275b.

[0063] Fig. 13 illustrates the placement of a location mark relative to a footwear piece 1300. In the illustrated embodiment, the location mark forms an indentation 1340 surrounded 30 by a halo 1330, or imprint. Halo 1330 extends from approximately one sixteenth of an inch below an edge 1310 of footwear piece 1300 to an edge 1320 of a pattern 1350 formed on footwear piece 1300. Halo 1330 can be approximately the same size and shape as the head of the rivet connecting footwear piece 1300 to a strap (not shown). By offsetting halo 1330 from edge 1310, the installed rivet does not dig into a foot inserted into footwear piece 1300.

WHAT IS CLAIMED IS:

- 1 1. A footwear mold, the footwear mold comprising:
2 a footwear form, wherein the footwear form includes a location mark
3 corresponding to a location of a strap rivet.

- 1 2. The footwear mold of claim 1, wherein the footwear form is an inner
2 portion of the footwear mold.

- 1 3. The footwear mold of claim 2, wherein the footwear mold further
2 comprises:
3 an upper portion and a lower portion, wherein the upper portion and the lower
4 portion substantially encompass the footwear form.

- 1 4. The footwear mold of claim 3, wherein at least the upper portion
2 includes a material inlet.

- 1 5. The footwear mold of claim 3, wherein the footwear form is suspended
2 from the interior of the upper portion.

- 1 6. The footwear mold of claim 1, wherein the location marked extends
2 from the footwear form and is operable to reduce material forming a finished footwear piece
3 at the location of the strap.

- 1 7. The footwear mold of claim 1, wherein the location marked extends
2 into the footwear form and is operable to increase material forming a finished footwear piece
3 at the location of the strap.

- 1 8. The footwear mold of claim 1, wherein the location mark further
2 includes a halo section that roughly corresponds to the size of a rivet head upon expansion of
3 a material forming an expanded footwear piece.

- 1 9. A method for manufacturing a footwear mold, the method comprising:
2 forming a location mark in a footwear form, wherein the footwear form is an
3 inner portion of a three piece mold.

1 17. A piece of footwear as in claim 16, wherein the adjustment mechanism
2 further comprises a coupling arrangement to couple the free end of the strip of material to the
3 strap.

1 18. A piece of footwear as in claim 17, wherein the coupling arrangement
2 comprises a plurality of snaps.

1 19. A piece of footwear as in claim 17, wherein the coupling arrangement
2 comprises a hook and loop fastener material.

1 20. A piece of footwear as in claim 14, wherein the at least one connector
2 comprises a pair of connectors coupled to opposite sides of the rear opening, and wherein the
3 at least one adjustment mechanisms comprises a pair of adjustment mechanisms that are
4 interactable with the pair of connectors.

1 21. A piece of footwear as in claim 14, wherein the strap is pivotally
2 connected to the upper portion.

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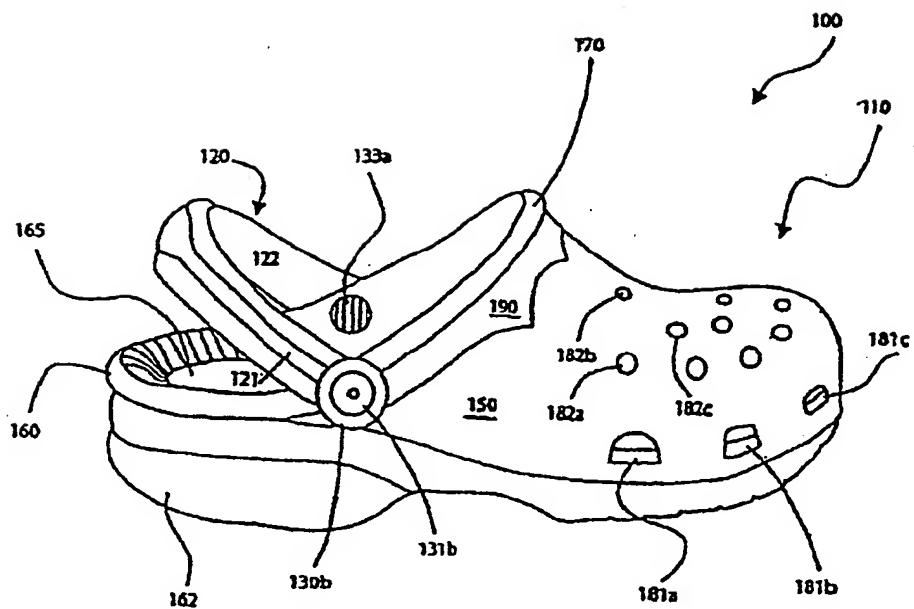


Fig. 2

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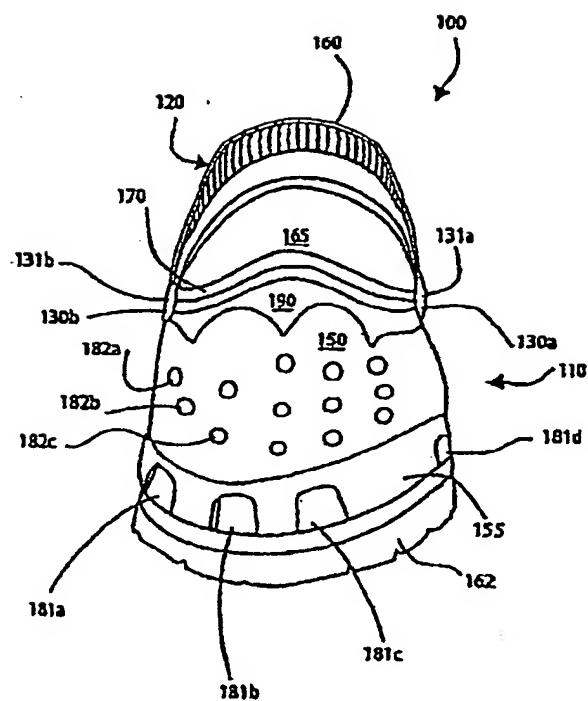


Fig. 4

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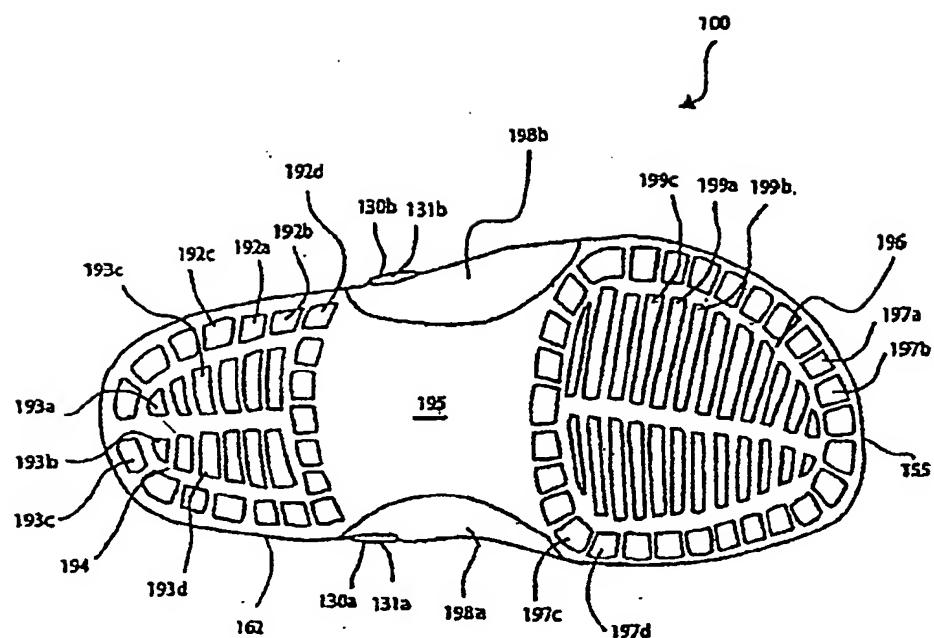


Fig. 6

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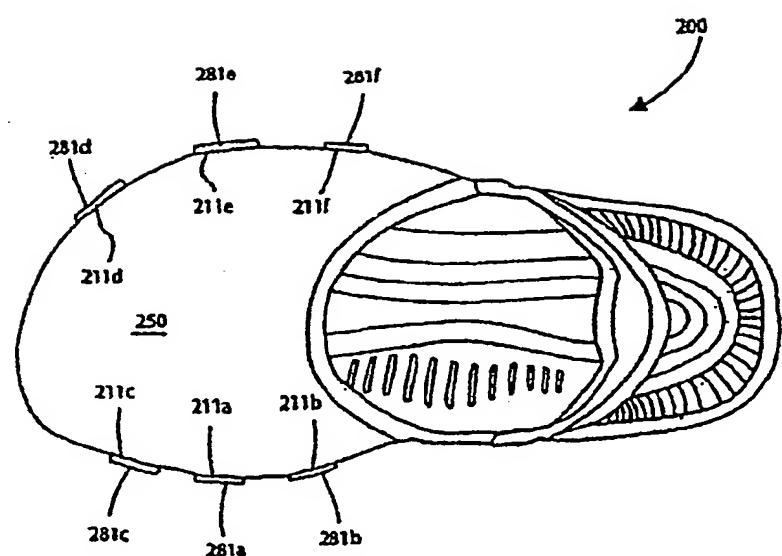


Fig. 8

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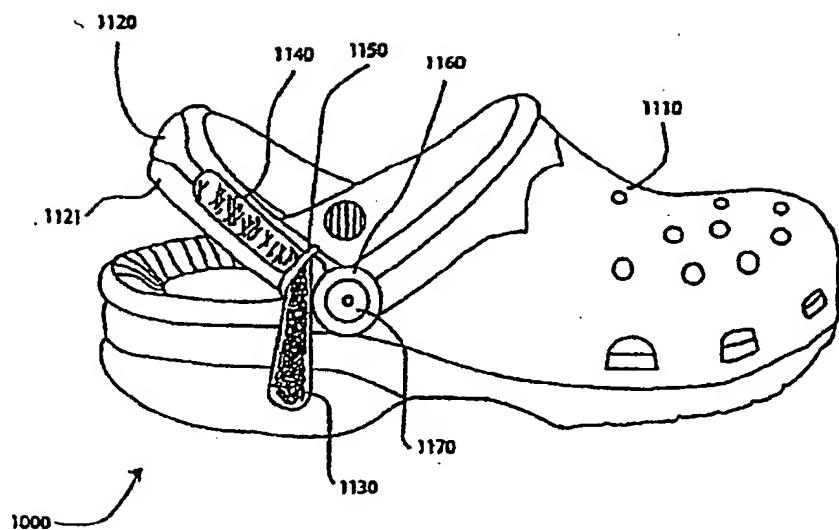


Fig. 10a

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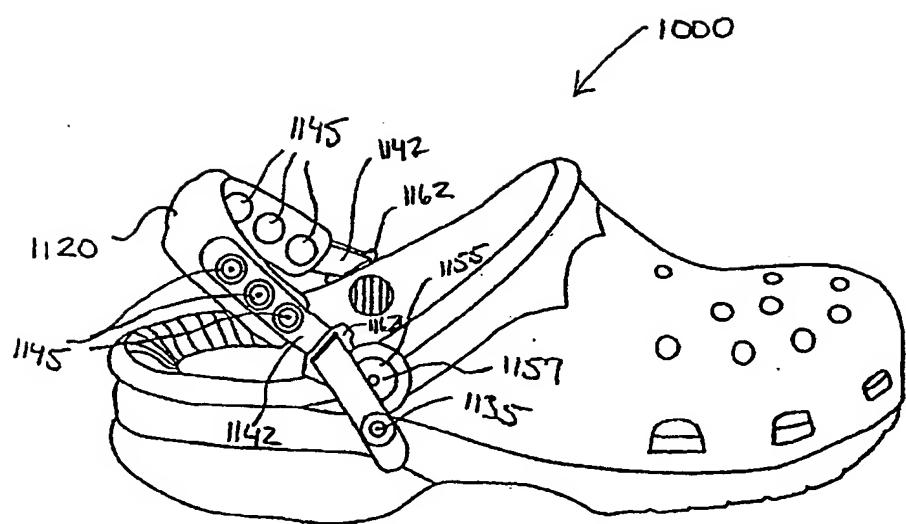


Fig. 10c

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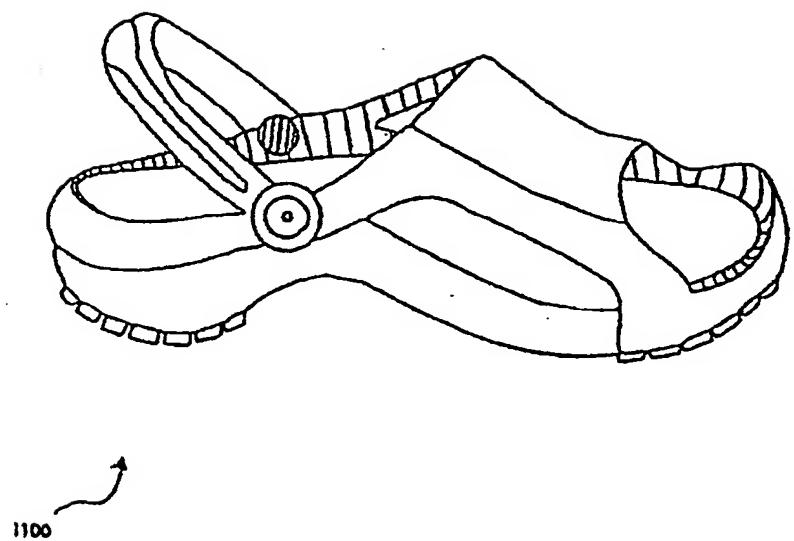


Fig. 11

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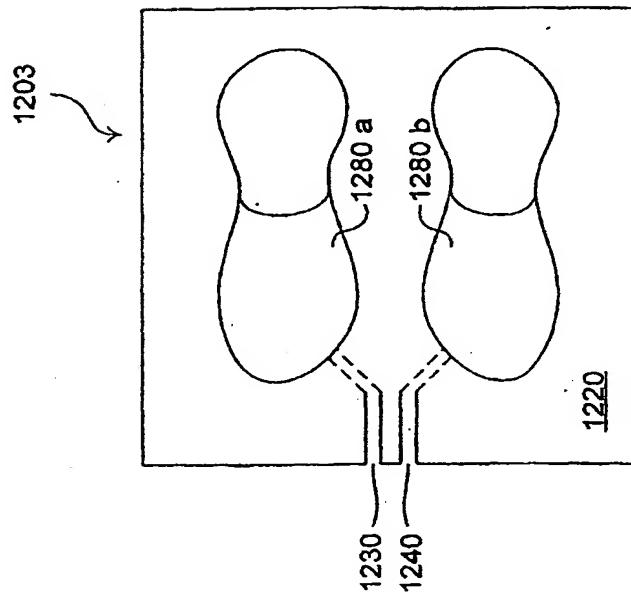


Fig. 12 d

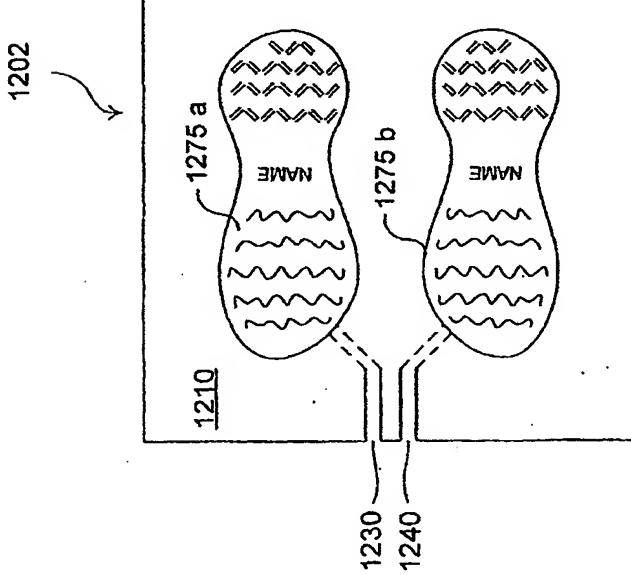


Fig. 12 c

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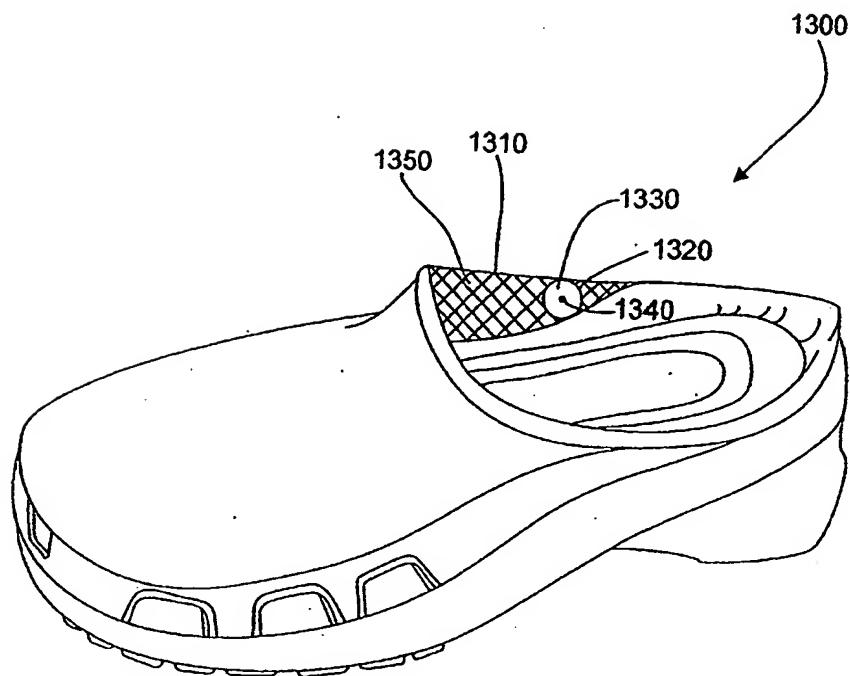


Fig.13

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/15132

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,052,920 A (BATHUM) 25 April 2000 (25.04.2000), see figures 1-4 and column 3, lines 55-58.	14-21



Published:

— without international search report and to be republished upon receipt of that report

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often do not provide the ease of use offered by the flip-flop. Further, such sandals are typically made of relatively slick material that does not grip well on, for example, wet floors.

[0005] Thus, there exists a need in the art to address these and other limitations.

5

BRIEF SUMMARY OF THE INVENTION

[0006] Among other things, the present invention provides various footwear pieces, and methods for manufacturing such pieces. In various cases, the footwear pieces are molded using a lofted, or foam material. In several exemplary cases, the footwear pieces include a pivoting strap that can be moved into contact with and fixed in relation to the sole of the 10 footwear piece, or moved into contact with and fixed in relation to the upper of the footwear piece. In several other cases, the footwear pieces include liquid conductors formed around ventilators, or holes, in the footwear piece. Such liquid conductors operate to disperse liquids away from a foot inserted in the footwear piece.

[0007] Some embodiments of the present invention provide breathable footwear pieces that 15 include a base section comprising an upper and a sole. The upper includes a substantially horizontal portion and a substantially vertical portion. The substantially horizontal portion is a solid portion, while the substantially vertical portion includes one or more ventilators formed in the substantially vertical portion. In particular instances, liquid conductors are formed around each of the ventilators. In some cases, the liquid conductors are molded as 20 part of the upper, while in other cases, the liquid conductors are attached to the upper after the upper is otherwise formed. In one particular case, the material used to form the base section exhibits a final growth value of approximately 1.51. Such a growth value provides a lightweight, comfortable footwear piece that floats in water, and is slip resistant when used on, for example, wet floors.

25 [0008] Other embodiments of the present invention provide sectional shoe pieces that include a base section and a strap section. The base section includes an upper and a sole formed as a part. The strap section is formed as a second part that is attached to the base section such that the strap pivots relative to the base section. In some instances, the base section is molded of a continuous piece of foam material. Such foam material can be a lofted 30 material manufactured using a resin base. Where a resin material is used, it can be mixed to exhibit an expansion coefficient, and a contraction coefficient. In particular cases, multiplying the expansion coefficient and the contraction coefficient results in a product, or a final growth value, of between 1.46 and 1.58, inclusively.

[0013] Similarly, the distance from one attachment point to the other attachment point along the upper opening perimeter is approximately the same as the distance between the attachment points measured along the strap section. Thus, the strap section can pivot relative to the base section such that an inner portion of the strap section contacts an outer portion of the upper opening perimeter. A frictional force between the strap section and the base section at the contact between the inner portion of the strap section and the outer portion of the upper opening perimeter maintains the strap section fixed relative to the base section. Again, in such a position, the strap section forms what appears to be a decorative portion of the base section, and does not interfere with inserting and removing a foot from the base section.

5 10 Further, in some cases, the strap can be fixed in contact with either the upper opening perimeter or the rear sole perimeter.

[0014] In various cases, a number of ventilators are formed in the upper. Such ventilators can be holes of varying sizes that allow liquid and/or air to pass through at prescribed locations in the upper. In some cases, such ventilators are formed in both a substantially horizontal portion of the upper and a substantially vertical portion of the upper. This provides for a significant amount of ventilation for applications where it is not necessary to protect the foot from exposure to liquids entering through the ventilators. Such applications can include, but are not limited to, boating, beach use, fishing, and the like.

15 20 [0015] Alternatively, some instances include a solid covering over the substantially horizontal portion of the upper, while including ventilators formed in the vertical portions of the uppers. This provides for sufficient ventilation, while at the same time protecting a foot from spilled liquids. Such an approach may be desirable for applications including use by medical personnel, chefs, and the like. Further, in some cases, a liquid conductor is formed around at least a portion of a perimeter of each of the plurality of ventilators. Such a liquid conductor transfers a liquid spilled on the upper around and away from the various ventilators formed in the substantially vertical portion. Such conductors can thus further protect the foot 25 from exposure to spilled liquids.

25 30 [0016] In particular cases, the toe region of the upper is extended at a location corresponding to the larger toes of the human foot. Thus, the toe region of the upper generally follows the contour of a human foot from larger toes on the inside of the shoe to smaller toes on the outside of the shoe. Such an approach can provide increased comfort and/or functionality. Further, the rear perimeter of the sole can be raised above a support base further increasing the functionality of the shoe. This support base can include a raised pattern where the foot contacts the shoe.

reference is made to a reference numeral without specification to an existing sub-label, it is intended to refer to all such multiple similar components.

[0022] Figs. 1-6 are views of a footwear piece in accordance with embodiments of the present invention;

5 [0023] Figs. 7-8 are views of another footwear piece in accordance with other embodiments of the present invention;

[0024] Fig. 9 is a flow diagram illustrating methods for manufacturing in accordance with embodiments of the present invention;

10 [0025] Figs. 10 illustrates another footwear piece in accordance with other embodiments of the present invention; and

[0026] Fig. 11 illustrates yet another footwear piece in accordance with various embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

15 [0027] Among other things, the present invention provides various footwear pieces, and methods for manufacturing such pieces. In various cases, the footwear pieces are molded using a lofted, or foam material. In several exemplary cases, the footwear pieces include a pivoting strap that can be moved into contact with and fixed in relation to the sole of the footwear piece, or moved into contact with and fixed in relation to the upper of the footwear
20 piece. In several other cases, the footwear pieces include liquid conductors formed around ventilators, or holes, in the footwear piece. Such liquid conductors operate to disperse liquids away from a foot inserted in the footwear piece.

[0028] Turning to Fig. 1, a footwear piece 100 in accordance with some embodiments of the present invention is illustrated. Footwear piece 100 includes a base section 110 and a
25 strap section 120. Base section 110 includes an upper 150 and a sole 162. In some embodiments, base section 110 is molded as a single piece of foam material. In other embodiments, sole 162 is molded from a foam or other foam like material, while upper 150 is manufactured of a different material that is later assembled with sole 162 to form base section 110.

30 [0029] Upper 150 includes a substantially horizontal portion 152 that can include one or more ventilators 182. Ventilators 182 can be, but are not limited to, openings that are formed in upper 150 as base section 110 is being molded. Alternatively, ventilators 182 can be openings formed in upper 150 after formation and/or assembly of upper 150. In yet another

[0033] Sole 162 includes a rear sole perimeter 160 that defines the rear portion of sole 160. In some cases, this region is raised above a support base 165 that is the area that is in contact with the bottom part of the human foot. Such a raised rear sole perimeter provides some support to the heel of the human foot and helps maintain footwear piece 100 in position. In 5 other embodiments, rear sole perimeter 160 is not raised.

[0034] Strap section 120 includes an outer region 122, an inner region 121, and rounded ends 130. In some cases, strap section 120 is attached to base section 110 by rivets 131 that are placed through holes in both strap ends 130, and in upper 150 at an attachment point. Strap section 120 can be pivoted in relation to base section 110 such that strap section 120 10 can contact upper opening perimeter 170 when pivoted in one direction, and rear sole perimeter 160 when pivoted in the other direction. In some embodiments, strap section 120 includes dimensions such that when strap section 120 is pivoted forward, inner region 121 contacts an outer surface of upper opening perimeter 170. A frictional force at the contact of inner region 121 and upper opening perimeter 170 maintains strap section 120 in a fixed 15 position relative to base section 110.

[0035] Alternatively, strap section 120 can include dimensions such that when strap section 120 is pivoted backward, inner region 121 contacts an outer surface of rear sole perimeter 160. A frictional force at the contact of inner region 121 and rear sole perimeter 160 maintains strap section 120 in a fixed position relative to base section 110. In such positions, 20 strap 120 can be a decorative portion of footwear piece 100.

[0036] As yet another alternative, strap section 120 can be placed in an intermediate position between rear sole perimeter 160 upper opening perimeter 170. In this position, the strap serves the utilitarian purpose of lending support to the Achilles portion of the human foot, thus helping to maintain footwear piece 100 in position on the human foot. In some 25 embodiments, a frictional force developed between strap 120 and upper 150 at the location of the rivets is sufficient to maintain strap 120 in place. This helps to assure that strap 120 remains in place even when the Achilles part of the foot is not pressing against strap 120. Without such friction, strap 120 would succumb to gravity and fall to a position where the footwear piece may not be maintained secure to the foot. At the same time, it can be 30 desirable to reduce the frictional force at the contact point sufficient to allow strap 120 to be readily moved.

[0037] In particular embodiments, strap 120 is formed of a foam material capable of significant deformation making footwear piece 100 comfortable for a large number of foot types. In other embodiments, strap 120 is form of a less deformable material offering greater

[0041] Turning to Fig. 10a, another footwear piece 1000 in accordance with other embodiments of the present invention is illustrated. Footwear piece 1000 is similar to previously described footwear piece 100, except that strap 1120 has been modified to allow for adjustment. As illustrated, strap 1120 includes a main portion 1121 and a connection portion 1160. Connection portion 1160 is attached to a base section 1110 of footwear piece 1000 by a rivet 1170, or some other pivotable connection as is known in the art. Main portion 1121 is attached to the opposite side via a rivet (not shown), and includes a male Velcro portion 1140 attached thereon, and a female Velcro portion 1130 extending like a tongue therefrom.

5 [0042] Female Velcro portion 1130 is fed through a buckle 1150 that is attached to connection portion 1160 and pulled until the desired tightness is achieved. Female Velcro portion 1130 is then laid over male Velcro portion 1140 as depicted in Fig. 10b. One of ordinary skill in the art will appreciate that other connection materials can be used in place of Velcro and that the male 1140 and female 1130 Velcro portions can be interchanged.

10 [0043] Further, based on the disclosure provided herein, one of ordinary skill in the art will appreciate that an adjustment can be used on either or both sides of strap 1120, or can be placed in the center of strap 1120.

15 [0044] Fig. 11 illustrates yet another footwear piece 1100 in accordance with some embodiments of the present invention. Footwear piece 1100 is an open toe model with a pivotable strap. Based on the disclosure provided herein, one of ordinary skill in the art will appreciate that adjustable strap 1120 depicted in Figs. 10 can also be used in relation to footwear piece 1100.

20 [0045] As previously suggested, the footwear pieces disclosed herein can be made of a lofted foam material. Manufacturing footwear pieces using such a lofted foam material can include providing a resin that includes a pre-mixture of resin, pigment, and a growth additive. The resin, originally in pellet form, is heated to a liquid state. This liquid resin is screwed into a mold that has been heated prior to receiving the resin. The volume of resin injected into the mold is controlled by the pitch of the screw that drives the liquid resin into the mold. The liquid resin is allowed to set, at which time the mold is opened and the formed footwear piece is removed from the mold. The formed footwear piece is then placed on a cooling last, where it is allowed to air dry.

25 [0046] During this process, a relatively small footwear piece conforming to the size of the mold is created, but when the mold opens, the footwear piece springs out as it expands in size. Then, as the footwear piece is air cooled, it contracts to a final size. Thus, the process

[0049] Some embodiments of the present invention utilize an EVA as previously described that is known commercially as LEVIREX™, and is marketed by FINPROJECT™ of Italy. It has been found desirable to create a mixture of LEVIREX™ that exhibits a final growth value of between 1.47 and 1.58. In one particularly desirable embodiment, a final growth 5 value of approximately 1.51 is used. This includes an expansion characteristic of approximately 2.5, and a contraction characteristic of approximately 0.6. This provides a relatively soft footwear piece that has very good anti-slip capabilities, and at the same time, size reproducibility and durability.

[0050] In some cases, the resin mixture (LEVIREX™, growth additive such as 10 ENGAGE™ by DUPONT™, and pigment) is modified depending upon the desired color of the footwear piece. This is at least in part due to the density of the pigment associated with certain colors. Were the resin mixture not adjusted, a green footwear piece would be produced appreciably smaller than a khaki footwear piece where all other factors remain constant. This can be unacceptable where, for example, the footwear pieces are to be sold 15 over the Internet and the consumer is not capable of trying the footwear piece on before purchasing. To alleviate this, the final growth value for a green resin is adjusted to approximately 1.515, where the final growth value for the khaki resin is adjusted to approximately 1.505. Thus, by modifying the mixture, shoes of accurate sizes across multiple colors can be produced.

[0051] While footwear pieces can be molded as previously described, based on the disclosure provided herein, one of ordinary skill in the art will appreciate that various 20 embodiments of the present invention can be utilized in relation to other molding processes, and or assembly methods. For example, a hard plastic footwear piece could be injection molded using techniques known in the art, or a footwear piece could be at least partially made of leather or other natural materials. As another example, the footwear piece could be 25 Freon cooled, rather than air-cooled. This could be used to speed the manufacturing process.

[0052] The invention has now been described in detail for purposes of clarity and 30 understanding. However, it will be appreciated that certain changes and modifications may be practiced within the scope of the appended claims. Accordingly, it should be recognized that many other systems, functions, methods, and combinations thereof are possible in accordance with the present invention. Thus, although the invention is described with reference to specific embodiments and figures thereof, the embodiments and figures are merely illustrative, and not limiting of the invention. Rather, the scope of the invention is to be determined solely by the appended claims.

1 11. A breathable workshoe, the breathable workshoe comprising:
2 an upper;
3 a sole; and
4 wherein the upper includes at least one ventilator surrounded by a liquid
5 conductor.

1 12. The breathable workshoe of claim 11, wherein the upper and the sole
2 are formed as a single part.

1 13. The breathable workshoe of claim 12, wherein the single part is
2 manufactured from a foam material.

1 14. The breathable workshoe of claim 11, wherein the liquid conductor is
2 formed as part of the upper.

1 15. The breathable workshoe of claim 11, wherein the liquid conductor is
2 attached to the upper.

1 16. A method for manufacturing a breathable workshoe, the method
2 comprising:

3 providing a mold, wherein the mold provides an outline of an upper and a sole,
4 and wherein the upper includes a substantially horizontal portion and a
5 substantially vertical portion, and wherein the substantially horizontal portion is a solid
6 portion, and wherein a plurality of ventilators are formed in the substantially vertical portion;
7 screwing a volume of resin into the mold, wherein the resin sets in the form of
8 a footwear piece;

9 opening the mold; and
10 removing the footwear piece.

1 17. The method of claim 16, wherein the outline of the upper includes
2 liquid conductors formed around each of the plurality of ventilators.

1 18. The method of claim 16, wherein the method further comprises:
2 air cooling the footwear piece.

1 29. The sectional footwear piece of claim 21, wherein the strap section is
2 attached to the base section by a first rivet and a second rivet, wherein the first rivet fastens a
3 first end of the strap section to a first side of the base section, and wherein the second rivet
4 fastens a second end of the strap section to a second side of the base section.

1 30. The sectional footwear piece of claim 29, wherein the first rivet and
2 second rivet are made of a plastic.

1 31. The sectional footwear piece of claim 30, wherein the strap section and
2 the base section are formed of a lofted foam material, and wherein the plastic is denser than
3 the lofted foam material.

1 32. The sectional footwear piece of claim 29, wherein the first rivet is
2 placed at a first attachment point, wherein the second rivet is placed at a second attachment
3 point, wherein the base section includes a rear sole perimeter, and wherein the distance from
4 the first attachment point to the second attachment point along the rear sole perimeter is
5 approximately the same distance from the first attachment point to the second attachment
6 point along the strap section.

1 33. The sectional footwear piece of claim 32, wherein the strap section can
2 pivot relative to the base section such that an inner portion of the strap section contacts an
3 outer portion of the rear sole perimeter.

1 34. The sectional footwear piece of claim 33, wherein a frictional force
2 between the strap section and the base section at the contact between the inner portion of the
3 strap section and the outer portion of the rear sole perimeter maintains the strap section fixed
4 relative to the base section.

1 35. The sectional footwear piece of claim 29, wherein the first rivet is
2 placed at a first attachment point, wherein the second rivet is placed at a second attachment
3 point, wherein the base section includes a upper opening perimeter, and wherein the distance
4 from the first attachment point to the second attachment point along the upper opening
5 perimeter is approximately the same distance from the first attachment point to the second
6 attachment point along the strap section.

1 43. The sectional footwear piece of claim 21, wherein the sole comprises a
2 rear sole perimeter and a support base, and wherein the rear sole perimeter is raised above the
3 support base.

1 44. The sectional footwear piece of claim 21, wherein the sole comprises a
2 support base, and wherein the support base includes a raised pattern where a foot contacts the
3 support base.

1 45. The sectional footwear piece of claim 21, wherein the sole comprises a
2 bottom surface and a support base, and wherein the support base includes a raised pattern
3 where a foot contacts the support base.

1 46. The sectional footwear piece of claim 21, wherein the strap section is
2 attached to the base section through use of a punched hole.

1 47. The sectional footwear piece of claim 46, wherein a plurality of
2 ventilators in the form of holes are formed in the upper as part of manufacturing the base
3 section.

1 48. A sectional footwear piece, the sectional footwear piece comprising:
2 a base section, wherein the base section includes an upper and a sole, wherein
3 the upper includes an open rear region, and wherein the sole includes a rear perimeter; and
4 a strap section, wherein the strap section is attached to the base section by a
5 pivotable connection, and wherein the strap section is pivotable relative to the base section.

1 49. The sectional footwear piece of claim 48, wherein the pivotable
2 connection is a rivet.

1 50. The sectional footwear piece of claim 49, wherein the rivet is formed
2 of a material selected from a group consisting of: plastic and metal.

1 51. The sectional footwear piece of claim 48, wherein the base section and
2 the strap section are formed of a foam material.

1 52. The sectional footwear piece of claim 48, wherein the base section
2 comprises multiple assembled parts.

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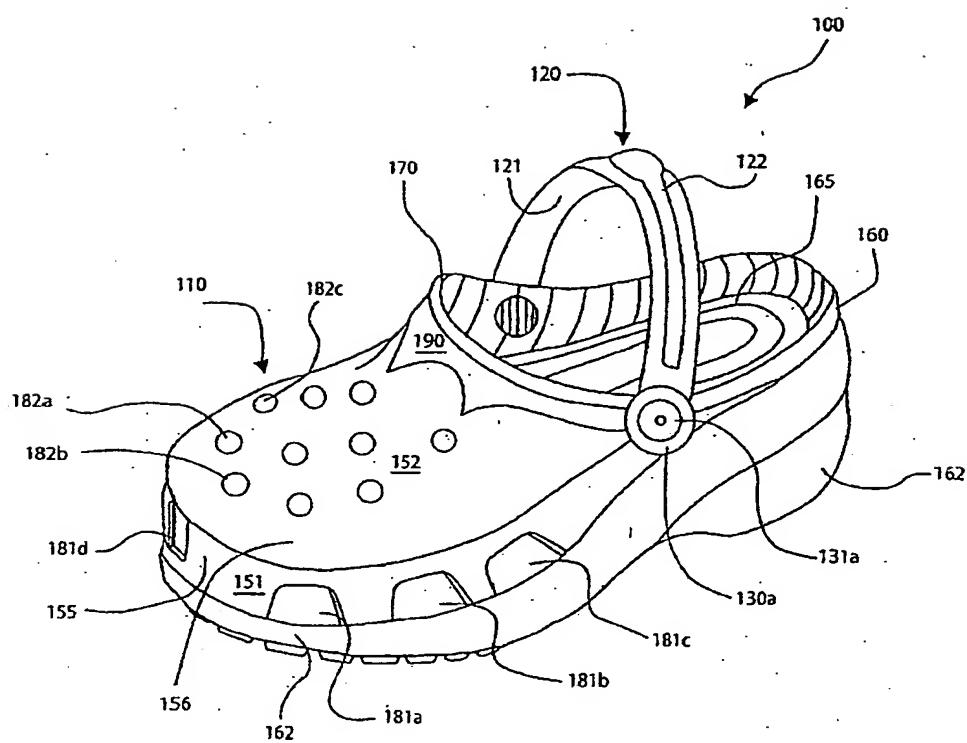


Fig. 1

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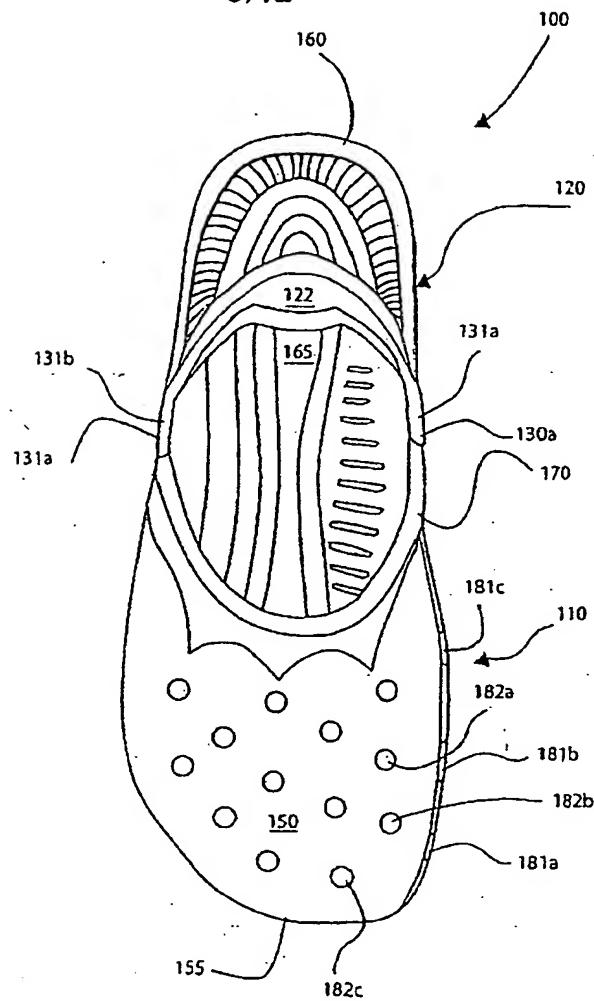


Fig. 3

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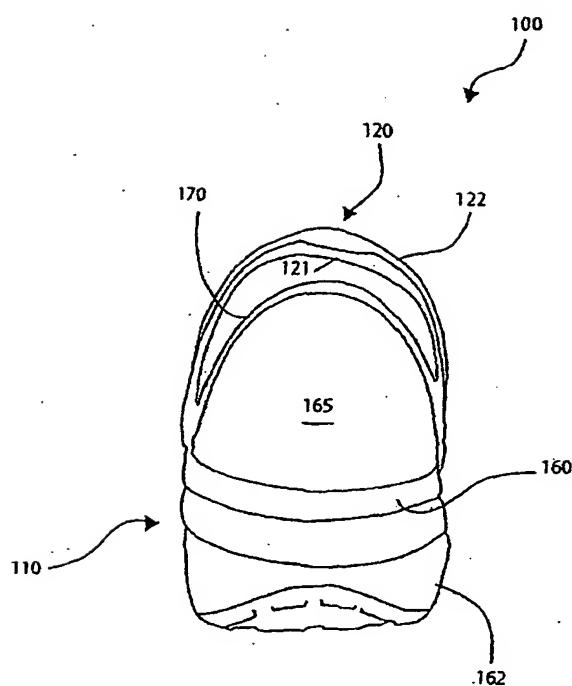


Fig. 5

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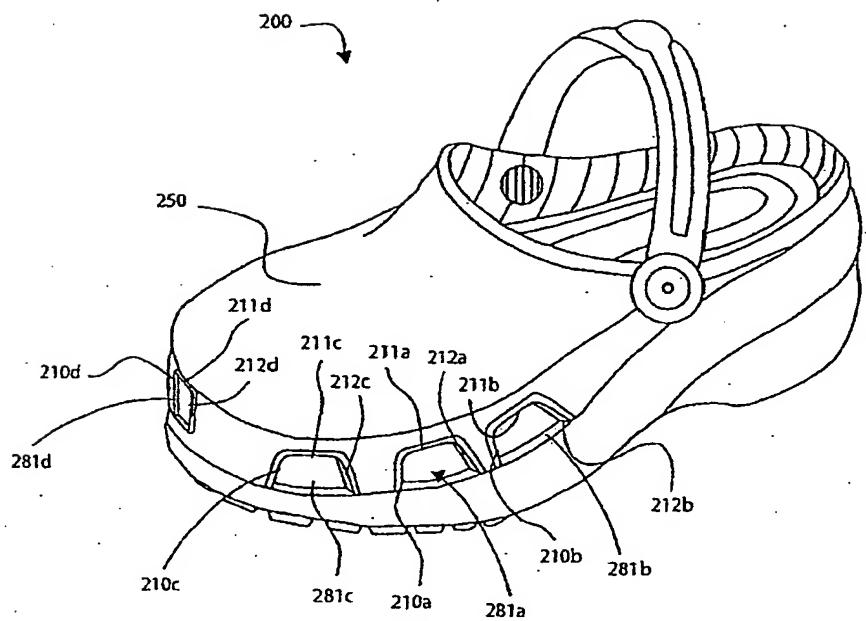


Fig. 7

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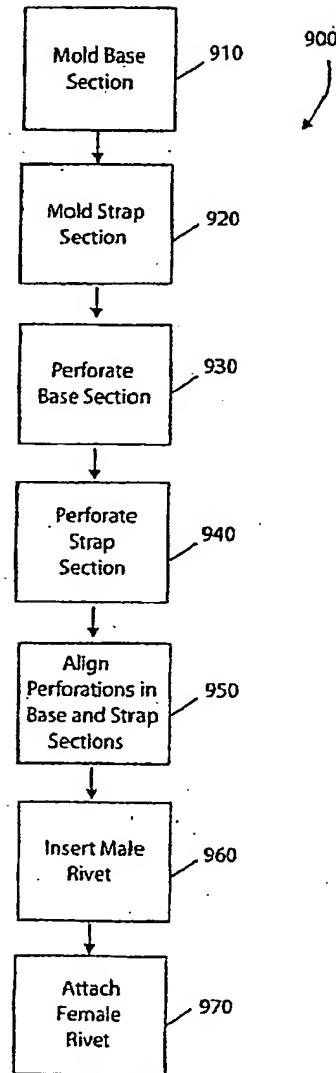


Fig. 9

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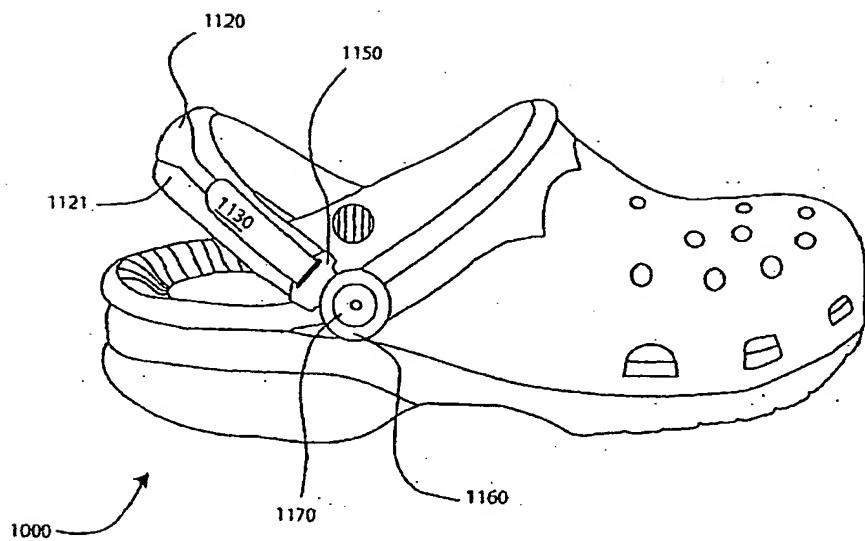


Fig. 10b

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number
WO 2004/105534 A3

(51) International Patent Classification⁷: A43B 7/06, 3/12

(21) International Application Number:
PCT/US2004/015227

(22) International Filing Date: 14 May 2004 (14.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/473,371 23 May 2003 (23.05.2003) US

60/473,360 23 May 2003 (23.05.2003) US

10/603,126 23 June 2003 (23.06.2003) US

10/602,416 23 June 2003 (23.06.2003) US

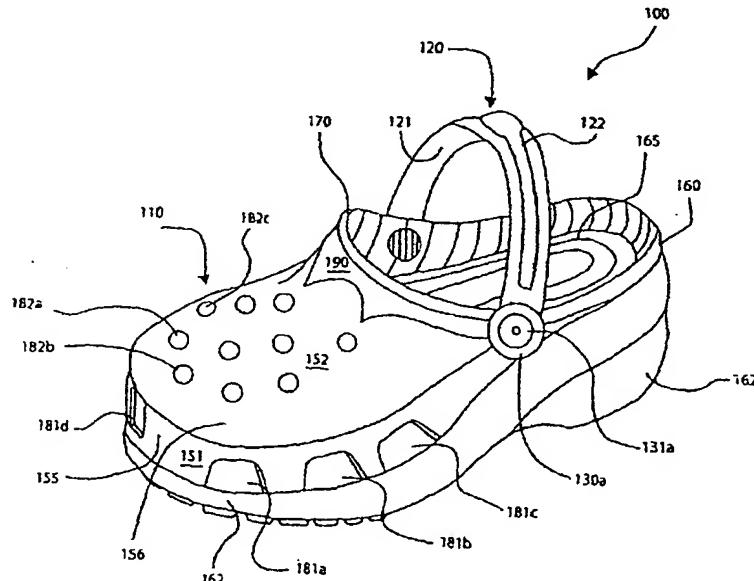
(74) Agents: GIBBY, Darin, J. et al.; Townsend and Townsend and Crew LLP, Two Embarcadero Center, Eighth Floor, San Francisco, CA 94111-3834 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: FOOTWEAR PIECES AND METHODS FOR MANUFACTURING SUCH



WO 2004/105534 A3

(57) Abstract: Footwear pieces (100), and methods for manufacturing such pieces. The footwear pieces are molded from a lofting material. The footwear pieces include a pivoting strap (122) that can be moved into contact with and fixed in relation to the sole of the footwear piece, or moved into contact with and fixed in relation to the upper of the footwear piece. The footwear includes one or more ventilators (181, 182) formed in the footwear piece that are surrounded by liquid conductors capable of channeling liquid spilled on the surface of the footwear pieces away from a foot within the footwear pieces.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/15227

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A43B 7/06; A43B 3/12

US CL : 36/3R, 3A, 3B, 29, 11.5, 7.5, 98; 264/46.4, 54, 245, 278; 12/142V, 142R

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 36/3R, 3A, 3B, 29, 11.5, 7.5, 98; 264/46.4, 54, 245, 278; 12/142V, 142R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
US-PGPUB, JP, EPO, DERWENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,476,600 A (SEIDEL et al.) 16 October 2004 (16.10.2004), See the entire document.	1-6 and 11-20
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Y		7-10
X	US 5,369,895 A (HAMMERSCHMIDT) 06 December 1994 (06.12.1994), See the entire document.	1-6, 11-20
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Y		7-10
X	US 6,237,249 B1 (AGUERRE) 29 May 2001 (29.05.2001), See the entire document.	21, 29-40, 43-50, 53-59
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Y		22-28, 31, 41-42, 51-52
A	US 5,814,254 A (BISCONTI) 29 September 1998 (29.09.1998), See the entire document.	16-20, 53-59

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Date of the actual completion of the international search		Date of mailing of the international search report	
14 December 2004 (14.12.2004)		13 JAN 2005	
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